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TABLE OF CONTENTS

Note.—Initialled abstracts are written by the following:

Mr C. Barclay .. C. B.
Mrs R. M. Ingham .. R. M. I.
Dr M. A. Keay .. M. A. K.
Mrs R. H. Richens .. R. H. R.
Miss E. Wilson .. E. W.
Dr H. C. Yin .. H. C. Y.
Mr I. Zacopanay .. I. Z.

* General studies, see also individual crops.

Plant Breeding Abstracts

Vol. XVIII, No. 3

*STATISTICS 519

1313. NANDA, D. 519.24:575:633(54)
Discussion.
Biometrics Bull. 1947 : **3** : p. 180.
Statistical procedures used in India to differentiate between genetic and non-genetic variation are mentioned. Reference is also made to the use of the discriminant function in selection.

1314. DELURY, D. B. 519.24:575.22
On the estimation of biological populations.
Biometrics Bull. 1947 : **3** : 145–67.
An examination is made of the inferences that can be drawn about the size of animal populations from sample catches.

1315. BOSE, R. C. 519.24:631.421
Recent work on "incomplete block designs" in India.
Biometrics Bull. 1947 : **3** : 176–78.
The work done in India on working out balanced incomplete block designs is briefly reviewed.
A general approach to the study of incomplete block designs is presented, in which, by means of appropriate combinatorial conditions, it is possible to derive a general class of partially balanced incomplete block designs in which balanced incomplete block designs and lattice designs occur as special cases.

1316. HAMMING, G. 519.24:631.421
Grafische verwerking van een Fisher-proef. (**Graphic correction of a Fisher experiment**).
Landbouwk. Tijdschr. Wageningen 1947 : **59** : 496–504.
The results of an experiment published by Wishart and re-analysed by Yates are corrected on the basis of fertility contours. Wishart and Yates eliminated fertility on the basis of a Latin square although it was not one, which forced them to use innumerable errors in one experiment. The fundamental idea, that the fertility is not orthogonal to the layout, is the same as Yates's. Yates, however, corrected the fertility orthogonally and left the actual experiment non-orthogonal. Here, on the other hand, the fertility is corrected non-orthogonally. The analysis of variance for treatments is then orthogonal, and the error variance is reduced to $\frac{1}{3}$ of Yates's figure.
Methods for estimating the degrees of freedom involved in these corrections are worked out, thus: "For row 41 the fertility is −17; this figure is entirely independent of the rest and therefore requires 1 degree of freedom. The fertility of rows 43–53 is constant 0, this is one figure and requires 1 degree of freedom. The fertility of 55 is 7, a fairly random amount, count 1 degree of freedom for it. The figures for 57–63 lie on a straight line, this requires 2 degrees of freedom. Thus in total 5 degrees of freedom have been used. But this calculation is not completely accurate. The sum of all the fertility deviations is *a priori* equal to 0. Thus 1 degree of freedom less has been used than we assumed. But perhaps we have overlooked one, therefore we leave the number at 5."
Evidence is deduced that the experimental area was used the previous year for an experiment of 4 blocks of 12 plots each, of which 3 plots exercised a good residual effect. The bottom row of plots was perhaps occupied by a footpath previously.
Finally a warning is given that it is much more difficult to correct results of an experiment that is carried out on the site of a previous experiment. If this cannot be avoided, attention should be paid to its possible effect on the new experiment.

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* General studies, see also individual crops.

It is concluded that, on the basis of an actual experiment, a sufficiently accurate estimate of the degrees of freedom used in applying a graphical correction can be obtained, and that in that case the advantage of the graphical correction over a "Fisher correction" is as great as that of a "Fisher correction" over no correction; and that by the graphical correction faults in experimental layout can be eliminated. It is also pointed out that Fisher does not make efficient use of degrees of freedom, because quantities that are closely related, e.g. rows and columns, are considered as independent. C. B.

1317. RADHAKRISHNA RAO, C. 519.24:631.421
General methods of analysis for incomplete block designs.
J. Amer. Statist. Ass. 1947 : **42** : 541–61.
Incomplete block designs are classified under one of two heads, partially balanced incomplete blocks, and intragroup and intergroup balanced incomplete blocks. All incomplete block designs represent particular cases of one of these two categories. The author shows how it is possible, proceeding via intrablock analysis, to perform other types of analysis with any particular design, using only a few formulae of general application.

1318. HOMEYER, P. G.,
CLEM, M. A. and
FEDERER, W. T. 519.24:631.421:621
Punched card and calculating machine methods for analysing lattice experiments including lattice squares and the cubic lattice.
Res. Bull. Ia Agric. Exp. Sta. Statist. Sect. 1947 : No. 374 : Pp. 171.
A description is given of a method of analysing lattices by means of punched cards. The machines required are a sorter, tabulator, and a gang summary punch.

*BREEDING 575

1319. 575:519:633(73)
News and notes.
Science 1948 : **107** : p. 219.
An account is given of the topics discussed at the plant breeding conference held by the Institute of Statistics at North Carolina State College from 26 to 30 January 1948.

1320. STOCKDALE, F. 575:633
Factors of agricultural production in the British Colonial Empire.
Nature, Lond. 1948 : **161** : 337–41.
Reference is made to the increased yields obtained as a result of the production of new strains of tropical crops.

1321. WING, A. S. 575:633
Behind the seed catalog.
Nature Mag. 1946 : **39** : 19–21.
A brief and very general discussion on the production of new varieties of flowers and food plants and the evaluation of new varieties is included.

1322. CARSON, G. P. 575:633(41 + 42)
Plant breeding.
J.R. Agric. Soc. 1947 : **108** : 154–66.
The significance of plant breeding in the attempt to solve various problems of crop production in Great Britain is discussed, reference being made to yield, quality, resistance and immunity to pests and diseases in the potato and other crops, variety trials and seed supplies. Existing plant breeding facilities are discussed, and the establishment of a series of substations is advocated, so that trials of varieties and selections could be undertaken under the varying conditions of soil and climate throughout the country.

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* General studies, see also individual crops.

1323. Bell, G. D. H. 575:633(42)

Crops and plant breeding.

J.R. Agric. Soc. 1947 : **108** : 1–14.

In this review of studies of English crops and plant breeding, reference is made to the following: farming systems and their effect upon soil fertility; the improvement of hill and marginal farms and of the production of protein-rich feeding stuffs; the occurrence of the Colorado beetle in the summer of 1947 on a scale sufficient to cause alarm, and the possibilities of eventually breeding for resistance by use of *Solanum demissum*; the control of virus yellows in the sugar beet; physiological investigations on the sugar beet in relation to bolting; the abnormal "yawning" condition of ears of the 1947 barley crop in the eastern counties; the new barley variety Earl bred by Hunter at the Cambridge University Plant Breeding Institute and put on the market in spring 1947; trials of introduced barleys and French wheats at the National Institute of Agricultural Botany; and new oats selections and hybrids under observation. In addition, the use of hybrid vigour in crop production and the breeding techniques of X-ray induced mutations and colchicine induced polyploidy receive general discussion.

1324. 575:633(47)

(Scientific report of the Alma-Ata State Breeding Station).

Ogiz, Seljhozgiz, Moscow 1945 : Pp. 104.

To meet the exceedingly varied conditions and requirements of the region of the U.S.S.R. served by the Alma-Ata Station, the work recorded in the following papers has been carried out:—

Udoljskaja, N. L. (*Seed production of cereal and oil-bearing crops*). (*pp. 8–17*).

Since 1941–42 the work of the Alma–Ata Breeding Station has included selection and seed production of winter and spring wheats and barley, oats, millet, sunflower, sesame, lucerne, *Agropyron*, fodder beet and fodder carrots.

The varieties available for seed selection, the methods and conditions of work in the plots and the results are enumerated at some length, with notes on the effects of rust and drought on the crops, yields, purity, 1000 corn weight, and drought and rust resistance of some varieties. There is practically no information on breeding, though intravarietal hybridization and an oat x wild oat cross are mentioned.

The second part of the paper deals with the method and the technique of seed production under various conditions.

In competitive trials at the station with seed from élite varieties of spring and winter wheats, the spring barley Precocius 0143, and the oat Zolotoĭ Doždj [Golden Rain], all except Precocius 0143 gave from 10 to 26% higher yields as compared with the yields from regionalized varieties.

Fedorov, P. F. (*Breeding winter wheat*). (*pp. 17–42*).

A detailed account is given of the methods, plant material and series of trials conducted in the Alma-Ata Province as part of the winter wheat breeding programme. The extensive initial material was obtained from the World Collection of wheats, and supplemented by numerous local strains from different regions and by hybrids derived from intervarietal and intravarietal crosses, crosses of geographically remote forms and of species.

Wheats suitable for the Alma-Ata region, with its wide range of different combinations of climatic and soil conditions, must possess, in addition to good yielding capacity, also resistance to frost, drought and disease.

Winter hardiness in the absence of snow cover is also necessary for cultivation in the region served by the Alma-Ata Station and in most of the Russian foothills, and the technique of determining this property received much attention; hints on the best procedure are given. Investigations were also pursued on the effects of (1) conditions during sprouting upon yield; and (2) time of winter and spring sowing on unirrigated land.

Petrovskaja, L. (*Breeding winter barley*). (*pp. 42–47*).

Details are given of the methods and work at the various stages in the different breeding plots and series of trials at the Alma-Ata Station. The object of the programme adopted is

to produce a sufficiently early, high yielding, winter hardy, disease resistant barley for the Alma-Ata region and for cultivation on irrigated and non-irrigated soil.
The initial material consists of Pallidum mainly, but also Pyramidatum, Bifurcatum and 2-rowed mutants. Some of the selections have been under observation for four years, others for two.

Udoljskaja, N. L. (*Breeding spring wheat*). (*pp. 47–60*).
Among the requirements as regards wheats for the Alma-Ata region are: high yield and baking quality; resistance to lodging, to dry atmosphere and soil, to rust and smut; and, for the foot-hills, also earliness.
The methods used, which are described, included intervarietal crossing and also interspecific and intergeneric hybridization. The results of artificial pollination were studied. Details are given of the initial material and its origin.
Among the most valuable hybrid combinations were: Marquis x Fetisovi 0333; Lusitanicum x Hordeiforme 0189; Erythrospermum 0841 x Marquis; Graecum 0283 x Marquis; and Erythrospermum 0841 x Fetisovi. Their main characteristics are described. In 1942, 54 selections from among true breeding hybrids were sown in the so-called "control" plot.
Mention is made of a correlation observed but not confirmed between segregation and the conditions of development of the grain, as exemplified by a relation between the presence of awns and the part of the ear (top, middle or bottom) from which the parent seed was taken.
An attempt was made to study the possibility of altering the habit of wheat by sowing winter wheat inadequately vernalized.
The performance of various wheats, e.g. Melanopus 0113, 0357, 0122, 0171 and 01951, Hordeiforme 0189, 0432, Afine 0309, Erythrospermum 09377 and Meridionale 03946, in different variety trials is recorded.

Udoljskaja, N. L. (*Breeding spring barley*). (*pp. 60–64*).
In breeding spring barley for the Alma-Ata region the aims are a variety superior to existing varieties in yield, resistance to drought and diseases, with grain as large as that of the standard variety Precocius 064, suitable for machine harvesting, with a non-brittle ear and a good long stem.
The initial hybridization material used when breeding was begun at the Cossack Institute of Agriculture comprised specimens from the World Collection of spring barleys and local material. Extensive hybridizations were carried out.
Among the most promising hybrids were some naked grained forms showing high tillering capacity, earliness, large grain and resistance to virus and fungous diseases.
Hulled barleys of special interest were derived from crosses of Precocius 0143 which surpassed the standard in yield and length of straw and equalled it in grain size.
Two forms of interest with valuable agricultural characteristics were Nutans 03 and Medicum 06, both obtained by individual selection.
One variety, Nutans Kazahstanskiĭ [Kazahstan Nutans] has done well in the official variety trials in 1942.

Sokolov (*Oat breeding*). (*pp. 64–69*).
Breeding was begun in 1939, the objectives being: higher yielding varieties adapted to the conditions of the Alma-Ata region; early and drought resistant oats for certain localities; and types resistant to lodging as well as drought for other parts. Individual selection is now in progress on non-irrigated and irrigated soil, the standard variety on the former being Markton, and on irrigated, Zolotoĭ Doždj [Golden Rain].
In competitive trials, the sowings of seven selections were based on the method of comparison of pairs of plots, in three replications, with the standard between each pair of plots. Yield and other economic features were noted. Out of four selections retained, Alma-Atinskiĭ 015 and Alma-Atinskiĭ 07 were regarded as promising. Both are pure lines from the Virovskaja K.I.Z. collection.
Alma-Atinskiĭ 015 (which originated from Asia Minor) had well filled grain, with a long husk and a coarse awn; it eared 11 days earlier than the standard, and ripened seven days earlier while exceeding it by 4·5% in yield.

Alma-Atinskiĭ 07 has well filled grain and a short and delicate awn and surpassed the standard in yield by 27·7%.
Both are more resistant to lodging than the standard.
Work with various unnamed selections in the preliminary trials, the control plots, the breeding plots, and the plot on which initial material (which includes plants from Palestine and Turkey) is raised is also mentioned.

Dreĭman, A. I. (*Millet breeding*). (*pp. 69–73*).

The main variety of millet assigned to the Province of Alma-Ata is Saratovskoe 0853, but it is too late for the district and is subject to diseases, especially smut.
In view of the markedly different soil and climate of the province, the breeder must provide: (1) for the high mountain zone, high yielding varieties resistant to fungous diseases; (2) for the semi-arid and arid regions, early disease resistant varieties that ripen before the onset of the dry spells; and (3) for the irrigated areas and the foot hills under a semi-irrigated or fully irrigated system of agriculture, highly productive varieties with large seeds, little husk and not subject to smut.
The initial material comprised local seed from nine regions of Kazahstan, and also plants from the Virov collection, including millets from Afghanistan, Transcaucasia, Iran, Kashgar, Mongolia, the Pamir, Japan, and the control Saratovskoe 0853.
Figures are cited showing the performance to date of the breeding material in the nursery plots in the so-called "control" plots, and in the preliminary trials and the competitive trials.

Dreĭman, A. I. (*Breeding of perennial herbage plants and seed raising*). (*pp. 73–80*).

In 1942 the Alma-Ata Station began the task of breeding new varieties of perennial herbage plants and the raising of seed of lucerne and sugar beet. Preliminary variety trials and seed plots had been laid down in 1940. The initial material of lucerne comprised samples from Asia Minor, Afghanistan, the Ukraine, America, Western China, Spain, Hungary, France, Central Asia and other parts of the U.S.S.R. The standard variety was Semirečenskaja lucerne, a local form from the En-Kazah region of Alma-Ata. Yield, winter hardiness, habit (including the shape of the rosettes during growth), colour of leaves and stipules, plant height, yield of hay, leafiness, thickness of stems, fertility and other morphological and physiological characteristics were studied.
The investigation showed that Semirečenskaja was a population and from it 18 forms differing morphologically and biologically were isolated. Five numbered forms were selected as the most interesting and four of them, Nos 1, 3, 7 and 12, were sown with some of the best available varieties of foreign origin for comparison. The fifth was isolated for multiplication as disease resistant.
Seed plots comprising 153 samples, including some wild forms of lucerne, were also laid down for comparison with Semirečenskaja as regards yield and winter hardiness. Only wild forms from the Alma-Ata Botanic Garden proved superior in yield and leafiness to the standard variety.
The production of lucerne seed was also included in the work of the Station.

Kuzjmič, K. F. (*Breeding of oil bearing crops and seed production*). (*pp. 80–92*).

Routine details are given of seed raising and variety testing of sunflower. The varieties Ždanovskiĭ 8281 and VNIIMK 4036 gave the best yields as compared with the standard Saratovskiĭ 169.
A collection of soya bean plants for use as breeding material was obtained from the Moldavian Breeding Station and the Far East Station, and some local Dungansk forms, grown on the borders of China and imported from that country 60 years ago.
A collection of 273 numbered lines was planted and tables are given showing the characteristics of the three different geographical groups of plants from the above-mentioned regions. Observations on the morphological and physiological features of the plants and

seeds are also given with similar information for the varieties Vengerka, Bendarskaja and Reĭner, from the Moldavian Station.
Work on oil flaxes was begun in 1936 with selections from material from the World Collection. The following five varieties were regarded as the best after variety trials: Tureckiĭ Nos 0177, 0179 and 0149; Marokkanskiĭ 09 and Kazahstanskiĭ 0615. All five suffered very little from disease. The colour of the flowers, length of stem, 1000 seed weight, earliness, and oil content are recorded.
Selection of white seeded and dark seeded sesame was carried out and some provisional results are given of the performance of types suitable for future breeding. Correlations were noted between seed colour and seed size and 1000 seed weight.
Work with *Arachis* was unsuccessful owing to sterility, probably due to soil conditions.

Kuksenko, F. N. and Perevozčikova, N. K. (*Breeding potatoes, sugar beet and rubber-bearing plants*). (*pp. 92–104*).

In 1942 investigations at Alma-Ata were begun on the effect on yield and quality in potatoes of planting (1) whole tubers from spring and summer sown crops and (2) apices of tubers and freshly harvested tubers. In the first experiment planting was done at seven dates between 16 April and 27 June; plantings from 27 May onwards were first vernalized for various periods. The results showed that, for all planting dates except the 18 May, the yield from summer tubers was higher than from spring ones. Hence seed potatoes for the Alma-Ata Province should be raised from summer plantings.
Sugar beet breeding was begun in 1942 at the Alma-Ata Station; roots selected on the basis of laboratory analysis of sugar content have been used as initial material, and yield, root weight and sugar content of the plants raised from it are being determined as a basis for further selection.
Sugar beet variety trials are also being run.
Breeding of kok-saghyz, krym-saghyz and tau-saghyz was begun in 1942, the last named species being represented in part by polyploid material obtained from Navašin. Germination of kok-saghyz was poor, but 120 of the best plants were chosen for their seed which was harvested separately. Tau-saghyz also showed poor germination and no mother plants were selected. As compared with the plants of kok-saghyz, Navašin's polyploids had luxuriant rosettes and larger flowers and seeds. The 1000 seed weight of the polyploids was 0·56 grm., and of krym-saghyz 0·32 grm. Seed plants from the polyploids were also chosen and are to undergo selection for size and rubber content of the roots.

1325. Guščin, I. V. 575:633(47)
(Varieties of field crops from the Krasnyĭ Kut State Breeding Station).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : No. 4 : 35–40.

Wheat
The varieties of *Triticum durum* produced by the Krasnyĭ Kut station have been particularly successful; Melanopus 69, a selection from the local race Beloturka, has exceeded that variety by 22% in yield; it is the most drought resistant variety of *T. durum* yet produced but does well too on moist ground. Hordeiforme 189, another selection, is somewhat less resistant to drought but in well watered zones will yield more than Melanopus 69. Hordeiforme 1932 is a selection from one of the hybrids of the Saratov station and is characterized by very vigorous growth in the shooting stage, owing to its low tiller number, which gives it great drought resistance; it has large vitreous grain, superior to Melanopus 69 in baking quality, and has exceeded that variety in yield by 10%. Melanopus 2556 resembles Hordeiforme 1932 in most features but is more resistant to loose smut.
As regards soft wheats, Erythrospermum 841 is extremely drought resistant and in dry years has exceeded Sarrubra by 25–30% in yield; it tends to lodge however and is difficult to thresh. Promising hybrids free from these defects have been obtained from crosses of Lutescens 62 x Erythrospermum 841 and the reciprocal; the best are Lutescens 2633 and 2634, which are also resistant to attack by insects, bunt and smut and are free from shedding.

Barley
The first barley variety to be distributed was Medicum 26, a high yielding barley with large grain, but too short in the straw for reaping with the combine harvester. The most widely grown are the six-row varieties Pallidum 43 and 45, whilst the most drought resistant is Persicum 64. For regions with higher humidity Nutans 187 is one of the best varieties, and Submedicum 199, which is slightly earlier and more drought resistant. The variety Boec [Fighter], a hybrid from a compound cross involving Medicum 26, Pallidum 45 and Nutans 187, has outyielded Pallidum 45, the standard. A naked barley, Nudum 21, has been produced but is somewhat inferior to the hulled forms in yield.

Forage grasses
Improved forms of *Panicum*, *Setaria* and *Agropyron* have been produced.

Legumes
High yielding forms of *Cicer arietinum* resistant to *Ascochyta* have been obtained by selection, and by complex hybridization three standard forms bearing their lowest pod at a height of 7–8 cm. from the ground have been produced; they have been named Skorospelka [Early Ripener], Alpha and Mogučiĭ [Powerful].
Drought and frost resistant forms of yellow lucerne have been produced by selection from the wild populations.

1326. RJAZANOV, JA. I. 575:633(47)
(A brief summary of the results and problems in the research work of the Institute of Grain Husbandry in the South-East of the U.S.S.R.).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : No. 1 : 5–25.

The overriding consideration in plant breeding for the South-Eastern regions of the U.S.S.R. is drought. Comparative analyses have been made of the meteorological conditions over a period of years and of the yields of winter rye and spring wheat, and it has been possible to define those conditions which lead to the best yields in each. The influence of various cultural measures, rotations and other operations on moisture conservation has been studied by the Saratov institute. A number of new and improved varieties suitable for these conditions have been produced and are described. The spring wheat Lutescens 15/12 is a product of complex hybridization, characterized by rapid development of the root system and rapid gain in dry weight in the developing grain; it is free from shedding, high in grain quality and exceeds Sarrubra in yield by up to 5 c. per ha. The spring wheat Albidum 43, the most drought resistant yet produced, is also a product of complex hybridization, and has a high rate of development of the primary and secondary roots, rapid filling of the grain and very uniform grain; it is free from shedding and has exceeded the standard by 2–2·5 c. per ha. in yield. New spring wheats for irrigated land are Lutescens 605 and 758, and the best winter wheat yet produced is the rye-wheat hybrid Lutescens 230, distinguished by its winter hardiness, standing capacity, and large vitreous grains of high baking quality.
Good results have been obtained with new varieties of other crops, such as Volžanka No. 7 winter rye; sunflowers with improved oil content such as Saratov No. 19, P–10, P4 and P–27, the last being a very early variety maturing in 77 days; and the millet Saratov Cream 311, characterized by a high extraction rate of 85%. Five perennial wheat selections from *Triticum* x *Agropyron* hybrids are under observation.

1327. RJAZANOV, JA. I. 575:633(47)
(Plan of the research work of the Institute of grain husbandry for the South-East of the U.S.S.R. for 1946–1950).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : No. 4 : 57–69.

In the section devoted to plant breeding the main problems indicated for the next five years are the production of special types of spring wheat with a growth rhythm such as to enable them to yield well in the dry summers of the Soviet South-East; this requires rapid early growth, well developed embryonic roots and early establishment of nodal roots, rapid

filling of the grain, and resistance to fungous diseases and shedding; grain quality must also be high. Other objectives are forms of *Triticum durum* with improved yield, soft spring wheats suitable for irrigated land, resistant to lodging and fungus attack, and winter wheats combining winter hardiness with high yield, grain quality and resistance to fungous diseases, pests and lodging.
In winter rye the desiderata are winter hardiness, large grain, and high yield; work on breeding cultivated perennial rye will continue.
Triticum x *Agropyron* hybrids will be further investigated and multiplied and crosses of wheat with other genera such as *Elymus*, and with other species of *Agropyron* will be studied.
With oil crops the objectives comprise breeding sunflowers combining high yield and oil content with resistance to drought, broomrape and shedding, study of the possibilities of using hybrid seed, and testing other plants for oil production.
Millet varieties should combine yield, drought resistance, grain quality and freedom from shedding and lodging.
Lucerne will be bred for yield of seed and hay and for tolerance to the unfavourable conditions of the region.
Other problems include cytological study of interspecific hybrids, the study of the incompatibility relationships of the graminaceous species and means of overcoming it, improvement of the system of seed production of the different crops and the testing of a wide range of new species introduced from abroad or from the wild state.

1328. *Åkerman, Å. 575:633(48.5)
Årsberättelse över Sveriges Utsädesförenings verksamhet år 1946. (**Annual Report on the work of the Swedish Seed Association during 1946**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 309–69.

Work proceeded as in previous years augmented by the erection of new buildings at the Östgöta and Värmland Branch Stations and the acquirement of land at Nygård. Numerous grants from the government and private sources were received, staff was increased and the contacts were maintained with various official institutes, associations and commercial and other concerns interested in plant breeding.
Among the new varieties and strains handed over for multiplication during the year were: the autumn wheat U 01392 b_2, a new élite of the autumn wheat U 01392 (from the cross Ergo x Gluten), with a higher yield and stiffer straw than Ergo; the autumn rye 0801 b_1, a new variety from Stjärn x 0280 (a line from Prof. Heinrich rye), specially suited to the droughty region of eastern Sweden and surpassing the Petkus ryes in strength of straw; the two-rowed barley 02000 (from Peragis x Maja), a promising new malting barley which is as high yielding as Ymer; the six-rowed barley 06000 (from Dore x Vega), which is very early and surpasses both parents in yield; the potato 42096, an extremely early, wart immune variety obtained from the cross King George x Böhms Mittelfrühe, and a competitor of Early Puritan; the sugar mangel 0101, a new white, green topped strain; the new blue sweet lupin 01501 from a German blue sweet lupin crossed by a blue bitter commercial variety; the red clover Sv 026, an early strain derived from Merkur with rapid after-growth; the autumn rapes 02 (Sv 45/55) and 03 (Sv 45/57), the first being a pedigree selection of Lembke's with a much higher yield than Svalöfs Senraps [Svalöf Late Rape], and the second a sister variety of 02; 0203 (Sv 44/107), a new variety selected from X-irradiated Svalöf Regina spring rape. The right to the designation "original" was granted for the new varieties of autumn wheat Hansa and Pärl II [Pearl II]; the autumn barley Bore; the Primus and Sirius oats; the fodder pea 01080; the blue sweet lupin 01501; and the potato Anna.
The following work is reported from the main Institute at Svalöf:—

Autumn wheat

Artificial freezing experiments confirmed previous field results in testing breeding material for high yield combined with the greatest possible winter hardiness.

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* An extended summary of this paper is on file at the Bureau.

Valuable observations on strength of straw and resistance to *Cercosporella* were made.
Some promising crosses as regards yield are mentioned, including the selections 01335, Sv 42/414 and 01421, hybrids between southern Swedish highly bred varieties and lines from land wheat and superior to the varieties at present on the market.

Spring wheat
The breeding programme was continued along previous lines with special emphasis on baking quality of grain and strength of straw.

Autumn rye
At Svalöf and on sandy soil at Ugerup, breeding was continued by selection and progeny testing and with the same objectives as in 1946. Kungsråg II [King's II] did best with a yield of about 5000 kg. per ha. and next came 43/34 with 4900 kg. per ha.

Spring rye
Breeding of this crop has now been entirely transferred to Ugerup, where the work proceeded with the old material consisting of lines from Petkus and a land variety from Od in Västergötland and crosses between the two. Crosses were made between winter and spring ryes to obtain a high yielding spring form. Progeny tests were tried with both spring and winter rye.

Oats
Varieties for southern Sweden superior in yield, strength of straw and grain quality to the oats at present in cultivation were still the aim in white oat breeding. Good results have been obtained with several hybrid combinations, intended to combine the Örn type with earliness and larger grain. Crosses have been made with lines from white grained land oats. Work on a large scale was also carried out on crosses between the white varieties Sol II, Seger [Victory], Stjärn [Star] and Guldregn [Golden Rain] on the one hand, and specially early varieties such as Gopher, Finnish Kytö and Vidar, on the other, the object being to obtain early varieties suitable for the inland and higher lying parts of southern and central Sweden.
Among the early white oats the Finnish Eho oat and some lines from Gopher x Guldregn II gave the highest grain yield.
The very early oats Å 01390 (from Orion x Sirius), Sv 44/702 (from Engebrekt II x Orion II) and Orion III gave the best yields of grain for the type

Barley
Ymer élite b_1 was surpassed by b_3 and b_7 and by a few lines from the sister variety Sv 01515 (= 40/15) by about 200 kg. per ha. Of the fodder barleys derived from crosses of land barley with Maja or Kenia, many equalled or surpassed Maja in grain yield, but were not in general quite satisfactory as regards strength of straw.
Å. Gustafsson's X-ray mutants from Gull and Maja were extensively used in hybridization with the special object of utilizing their unusual strength of straw.
In the trials of six-rowed barley most of the high yielding, stiff-strawed lines from Primus x Asplund showed a tendency to breaking of the stems just under the ear.

Legumes
The best yielding fodder pea was Artturi.
The Östgöta Småvicker gave 2700 kg. per ha., while some new vetches included U 02281 (from Bulgarisk) with a yield of 2510 kg. Förädlad Sötvicker [Improved Sweet] and Förädlad Gråvicker [Improved Grey] yielded about 1500 kg.
The best lines of brown beans from the Ahleborg strain attained 1840 kg. per ha.

Herbage plants
Work included: variety trials; experiments on mixtures of meadow plants; manuring and watering; flowering, fertilization and seed setting in red clover; and preparations for analysis of carotene content of herbage plants at different stages of growth.
As regards resistance to root rot, early selections of medium late red clover, flowering only slightly later than Essi, showed a high degree of resistance fully equal to the best Merkur élites. The best of these early strains, Sv 026, was handed over to the General Swedish Seed Co. for multiplication. The alsike strains, Ötofte, Svea and one improved strain were

entirely satisfactory as regards resistance to root rot, but all the local strains suffered very severely. The tetraploid red clover strains in first year ley suffered from drought and therefore did not give as high a first crop as the corresponding diploid strains, but their aftergrowth was more rapid and vigorous than in the diploids. The tetraploid alsike strains gave very good results in regard to first harvest and aftergrowth.
Selection in hybrid progenies of red clover was continued. Timothy crosses between different inbred lines were continued to discover the best combinations. Selection of hybrid material from blue and yellow lucerne crosses were made on a large scale to obtain high yielding types that set seed.
Inbreeding of white clover, *Bromus inermis*, rye grass and red fescue was continued.

Potatoes
The comparative trials were laid down at Borrestad and the most important new strains were located at Ugerup and Svalöf.
The production of virus-free strains was also part of the work carried on.

Root crops
Strain differences in beets, noted at Uppåkra, in root shape, branching and habit, were more marked on loamy, warm soil than on heavy, cold soil.
Two tetraploid strains of turnips were severely attacked by rot.
Differences in resistance to club root in swedes and turnips and bolting in beets were studied.

Textile plants
The highest yield per ha. of flax straw, 7530 kg., was produced by line b_2 from Sv 0220.
The X-ray mutant Sv 0800 (from Concurrent) again surpassed the parent variety in yield of straw but is late ripening.
The linseed Sv 01040, from a land flax from Studina in Rumania, gave the highest yield, 1930 kg. per ha., as compared with the control.
Work on hemp and perennial fibre plants is still proceeding.

Oil crops
Breeding aims continue to be higher yields and oil content, winter hardiness, stiffer stems and more reliable yields.
A grant of 25,000 Swedish kronor was received from the Central Association of Swedish Growers of Oil Crops [Sveriges Oljeväxtodlares Centralförening] and it is therefore possible to extend the scope of the work to include all oil crops grown in Sweden, while concentrating on the most important. The rape Sv 45/70 (from Wilnensis) gave the highest absolute yield, 4280 kg. per ha.

Poppy
The aim is to obtain a type that is early and high yielding with strong straw and capsules that all remain closed at full maturity. Some lines from the Mahndorf x Peragis cross have proved satisfactory as regards strength of straw and highly resistant to breaking of the straw, combined with an adequate or in some cases specially good yield.

Sunflower
The highest yielding line from Strimmig Solros [Striped Sunflower] x Karlik gave about 1640 kg. per ha.

Soya bean
Work proceeded along the same lines as in the 1945 report (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 91, and Vol. XVIII, Abst. 617).
Hybridization has yielded lines that are much earlier and more productive than the commercial varieties available. Some of the new lines have now been multiplied and it has been possible for the first time to test some of the Association's hybrids in bigger comparative trials.
Irradiation with X-rays to increase the frequency of mutation and tests of some lines from material thus treated were continued.
The earliest of the new lines in the comparative trials ripened on 20 September and yielded 1225 kg. per ha.

Kok-saghyz
Breeding was continued and work is proceeding to improve the method of analysis.

Blue and yellow lupin
Selection work and the production of X-ray mutants is reported.

Tobacco
Work was concentrated on renewed testing and selection of lines in the F_4 and F_5 from crosses between varieties Havanna 236 and Judy's Pride or Station Stand-up Burley and the Swedish strains Tofta, Per Pers and Fjälkinge.
Special experiments on fermentation of leaf from the trials and on direct quality estimation of the finished product were begun in consultation with the experiments of the Tobacco Monopoly.

Hops
At Svalöf and Näsum some new crosses were made. The hop garden at Svalöf was enlarged and new hybrids were planted.

Cytological Division
Field trials as well as smaller preparatory plots were run with polyploid material.
Tetraploid red clover and alsike strains, harvested at Svalöf and five of the Branch Stations, did well in competition with diploids. It is clear that breeding of the tetraploids should be continued in the district where they are to be grown. Small scale seed plots of tetraploid red clover were harvested where the trials were held. An experiment with timothy with different chromosome numbers is in progress.
Tetraploid sugar beets, fodder beets and sugar mangels are being tested by the Root Crop Division. The new tetraploid turnips were tried out at the Jämtland Branch Station.
The Oil Crop Division again ran trials with polyploid types of rape, winter turnip rape and white mustard. Work on pedigree material of tetraploid turnip rape and white mustard was continued.

X-ray experiments
Crop plants treated with X-rays included autumn barley with the object of increasing the strength of the straw and winter hardiness.
In a sister line of Ymer barley a mutant was obtained with a long, extremely well filled ear exceeding the known range of variation for two-rowed barley.
Yield trials with the best mutants of Gull barley, conducted at Svalöf and the Kalmar, Ultuna, Västernorrland and Luleå Branch Stations, again demonstrated that certain mutants may surpass the original lines in yield. The results of three years' yield trials with Maja mutants are now available. Some extremely stiff strawed types equalled the mother line in yield. One mutation, erectoides 16, ripened a week before Maja, has stiffer straw and a higher 1000 corn weight, and was only a few points below the present line in yield. For the first time morphological mutations from 40/13 b_7 were included in yield trials, and one mutant, a peculiar light green type, seems to give quite a high yield of grain.
H. Thunaeus, of the Stockholm Breweries Ltd., investigating malting quality in barley mutants, found a few cases in which the brewing qualities were superior to those of the parent lines.
Mutations affecting earliness were included in yield trials and in some instances the yields were remarkably good. Large scale hybridization was carried out.
A peculiar yellowish green X-ray mutation in flax showed increased yield of straw and the same yield of seed per ha as the parent line as well as an increase in the amount of long fibres.
Work was begun on a large scale on the experimental control of mutation in co-operation with the Nobel Institute for Physics (Prof. M. Siegbahn) and the Ministry of Defence (Prof. G. Ljunggren).
A survey of the work on mutation has been published (cf. Abst. 687). The *Chemical Division*, the *Cereal* and the *Flax Laboratories* (cf. Abst. 617). continued their work during the year.

Institute for Genetical Research
Collaboration with the Institute for Genetical Research of Lund University was continued. One line selection, the rye-wheat, averaged 8% less in yield than Skandia III, the control.

Some lines, however, showed equal or superior grain yield per plot as compared with the control. New rye-wheat forms of the "inbred rye + wheat" type were obtained.
Since direct comparison cannot be made of diploid and tetraploid ryes in the same experiment owing to the injurious effect of the pollen of ordinary rye on grain setting in the tetraploid, the tetraploid and diploid varieties were separated in 1946 and two wheat controls, Skandia III and Ergo were used. This experiment is being conducted at Svalöf, Ugerup and the five branch stations in southern Sweden. The rye experiment run at the Institute in 1946 included inbred ryes and ryes inter-crossed in various ways.
The polyploid barley material comprises 14 different primary tetraploids of the best commercial varieties and hybrid progenies in I_{10} for a cross of six-rowed winter barley and Primus II. New crosses between different tetraploid primary types were made and some F_1 and F_2 progenies were studied. The selected tetraploid hybrid barley has proved greatly superior to the primary tetraploids both in germination and yield. Line selection of this material was continued.
The cost of work on oil crops was defrayed by the Margarine Factories Sales Co. Ltd. [Margarin Fabrikarnas Försäljnings A.-B.]. A series of new polyploids, obtained by interspecific hybridization and colchicine treatment have been produced, comprising new synthetic forms of existing types of oil-bearing plants. Crosses between these new types and existing types in agriculture have resulted in considerable increases in yield. Inbreeding studies are also being made in connexion with this work.
Other work of the Institute is recorded in the report of Lund University (cf. Abst. 51).
The detailed reports on the work of the branch stations of the Association contain the following points of particular interest:—

Ultuna Station
The polyploid types of the red-clover strains, Ultuna, Offer, Svalöfs Renodlade [Svalöf Pure-bred] and Merkur x 1136 gave considerably higher yields than the corresponding diploids. They also showed marked differences in hardiness.
The Valinge strain of *Lolium perenne* from Södermanland proved the most winter hardy.

Legume Division
Many crosses were made, e.g. between culinary peas and a selection of the best marrowfats. Ambrosia II and Sv 03101 gave the highest yields, about 3400 kg. per ha., while the best of the fodder peas was Sv 01080 with 3560 kg.
A U line of Polish vetch again did best with 2310 kg. per ha.
A small seeded U line of field bean gave the best yield.
Co-ordination of the results of series of legume trials at Ultuna, Svalöf and other branch stations was undertaken including special experiments with peas, e.g. pea moth damage.

Östgöta Branch Station
Work was done on wheat, oats, barley, potatoes, lucerne, clover and timothy.

Kalmar Branch Station
Work on cereals and flax is recorded. The oat 01509 proved very resistant to rust. One flax variety raised by the Station and Sv 0220 gave the highest yields of straw, 19 and 32% respectively more than Blenda.

Västgöta Branch Station
Tetraploid clover strains (from Merkur and Merkur x Wambåsa) tested for the first time gave remarkably good yields.

Värmland Branch Station
The two highest yielding potato varieties, Sv 4296 and Sv 4283, had both King George as one parent, the pollen parent of the first named being Mittelfrüh, and of the second Parnassia.

Västernorrland Branch Station
Studies of seed setting in red clover and analyses of the carotene and vitamin C content were continued.
Two experiments with X-ray mutants from the barleys Gull and Maja were laid down. An early maturing line characterized by extremely stiff straw and a waxy layer was obtained

from Gull; it again outyielded its parent variety. One mutant line from Maja, erectoides 16, ripened four days before Maja, while equalling it in yield.
The new potato Sv 43084 from Svalöf outyielded the control as in the two previous years. Tetraploid clover strains outyielded the diploid control, Offer, one tetraploid strain from Offer x Ultuna yielding 16% more green forage, while tetraploid Offer exceeded the diploid parent strain in yield by 3%.

Jämtland Branch Station
Breeding of barley, herbage plants, peas and turnips was continued as well as investigations on seed setting in red clover and on potato leaf roll.

Övre-Norrland Branch Station
The first preliminary trials of white oats revealed some valuable forms among the breeding material.
In addition to a new élite of Bottnia timothy, another variety developed from a plant from Keräsjoki will probably be multiplied very soon.

1329. Åkerman, Å. 575:633(48.5)
Lokal eller centraliserad växtförädling. (**Local or centralized plant breeding**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 485–89.
In this lecture at the Ultuna meeting, 11 July 1947, the speaker demonstrated clearly the need for facilities for local experimentation in plant breeding and variety trials, etc., in a country as large as Sweden, in which conditions of soil and climate and local requirements vary so much.

1330. Lewis, D. 575:633(48.5)
The organisation of plant breeding and genetics in Sweden.
Heredity 1947 : **1** : 373–78.
The work of the various state owned and privately owned plant breeding stations in Sweden and the way in which their work is co-ordinated are discussed.

1331. Osvald, H. 575:633(48.5)
Växtodling och växtförädling i mälarlandskapen. (**Plant cultivation and plant breeding in the Mälar district**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 152–62.
The author discusses the relations between plant breeding and plant cultivation and some economic and political factors with special reference to the Mälar region in Sweden, situated between the two extremes of Skåne and Norrland. The needs of the region are also examined from the standpoint of the particular crops, and the types and varieties that should be bred.
More scope for the breeder in regard to facilities, equipment and staff and a still wider range of natural conditions in which breeding experiments and variety trials can be made are essential if the special problems of the Mälar district are to be successfully investigated.

1332. 575:633(52)
The Agricultural Experiment Stations of Japan.
General Headquarters Supreme Commander for the Allied Powers Natural Resources Section, Tokyo 1946 : Rep. No. 59 : Pp. 92. (Mimeographed.)
This report includes an account of the history, organization and objectives of the agricultural experiment stations in Japan.
In addition to the breeding work summarized below, it is mentioned that co-operative projects involving two or more prefectures are devoted to the breeding of maize, flax, cotton, potato, sweet potato and rape.

Field plot technique
It has been possible to collect only limited data on field plot technique. It appears that little use has been made of statistical methods. Experiments are generally conducted in single, duplicate, or occasionally in triplicate test plots. In many cases, varietal and other tests are repeated in different fields, with different fertilizers, dates and rates of seeding.

The same experiment may also be repeated in substantially the same way at several stations.

Plots are generally small. The usual sizes for plots of small grains appear to be 5 to 10 tsubos (approximately 20 to 40 square yards). So-called field experiments such as those used in the United States with plots large enough to be seeded and harvested with horse or power-drawn equipment are practically unknown in Japan.

A table gives the size of plots and number of replications used in fertilizer experiments on rice, wheat, potato and sweet potato at several prefectural stations, as reported by the Imperial Agricultural Experiment Station, Nishigahara, Tokyo.

Wheat

Wheat was a relatively unimportant crop in Japan until the beginning of the thirties, when a marked increase in area resulted from a five-year plan to increase production. During the same period a marked increase in yield per unit has also occurred, due to the production of new early maturing, disease-resistant varieties by the Imperial and prefectural stations and greater use of mineral fertilizers. Crosses between native and introduced varieties have played an important part in wheat improvement. Attention is drawn to the fact that on account of the great range in climatic conditions, differences in altitude and the prevalence of different diseases no single variety is widely adapted. Norin 20, grown on approximately one-third of the wheat area of Kyushu, is probably the most widely adapted variety.

An account is given of wheat-stripe disease (*Cephalosporium gramineum* Nish. et Ikata), and snow blight or damage due to infection with *Typhula Itoana*, *Fusarium* spp. and *Pythium* spp. following carbohydrate exhaustion. Twelve new varieties have been developed with some degree of snow-blight resistance.

The adaptation of varieties to restricted areas and the relation of plant characteristics to specific climatic and soil conditions and to diseases and pests have received considerable attention. Current investigations include the response of varieties to soil acidity and deficiencies of mineral elements, especially phosphorus and potassium.

Distribution of the F_3 and F_4 hybrid generations to subsidiary stations for preliminary tests is an important part of the breeding programme in Japan. The crosses are made at four central or primary breeding centres, viz. Konosu in Saitama Prefecture, Morioka in Iwate, Himeji in Hyogo, and Hainuzuka in Fukuoka. The F_3 and F_4 hybrids are distributed to certain prefectural stations, designated as local or secondary centres. The particular function of these stations is selection on the basis of preliminary tests for yield, disease resistance and other characters. Seed of the more promising selections is distributed to other prefectural stations in the region, known as tertiary centres. From ten to 20 of the more promising strains are included in a uniform series of tests throughout each region, the results of which are assembled at the primary wheat breeding centres, summarized, and reported to all the subsidiary stations concerned. The advantages claimed for this procedure are (1) full use of the better facilities and generally better trained personnel of the primary centres, and (2) the likelihood that the selections will include the most valuable segregates since they are made in the areas the breeding programme is intended to serve.

The technique of back-crossing appears to have been little used in breeding wheat and other small grains.

The report states that special experiment stations or facilities are provided for the investigation of the following problems: (1) the response of varieties to day length; (2) the preliminary determination of resistance of varieties and selections to freezing temperatures by means of a potassium chlorate injury test; (3) varietal resistance to snow blight, and the relation of damage to depth of snow, the period for which the snow lies on the ground, the carbohydrate exhaustion of the plant, and susceptibility to specific disease organisms; and (4) the determination of seed dormancy or sprouting in the ear after harvesting.

Barley

Two snow-blight resistant varieties have been developed. It is claimed that cultivation of these varieties during the last ten years in Niigata Prefecture has resulted in a three-fold increase in the barley acreage, and that barley cultivation in the mountains of the Aizu

district of Fukushima Prefecture is only possible by the use of the resistant varieties. Special stations are devoted to investigations on snow blight damage of barley and wheat. Current investigations also include the determination of varietal response to soil acidity and deficiency of specific mineral elements, as in the case of wheat.

Rice

Considerable varietal improvement was formerly contributed by the Japanese farmers; 17 varieties produced by them were still being grown in 1945. One of the best known of the varieties developed by selection from native varieties in the early improvement work carried out by the farmers and agricultural experiment stations is Asahi, selected by a farmer in 1909. Other important varieties produced by farmers include Shinriki, selected in 1877, Aikoku, selected in 1889, and Bozu, selected in 1895.

Riku 132 was selected by the Imperial Branch Tohoku Station on account of its resistance to *Piricularia*; the variety was first distributed in 1925 and is now one of the chief varieties cultivated in northern Honshu.

In about 1903 the Imperial Agricultural Experiment Station, Nishigahara, Tokyo, began to introduce foreign varieties and to cross introduced varieties showing resistance to *Piricularia* with native varieties. Breeding for resistance to *Piricularia* has been one of the main objectives in rice improvement since that time. The first resistant variety to be bred was used on Japanese farms in 1930. In 1945, 69% of the total rice area was sown with the resistant varieties and selections developed by the Imperial Station in co-operation with the prefectural stations.

The production of early-maturing varieties for northern Honshu and Hokkaido has played an important part in rice production. In 1868 the red-awned, early-maturing Akage variety, discovered by a farmer, permitted extension of the rice area to the Ishikari Valley. In 1895 the awnless Bozu variety, also selected by a farmer, is credited with increasing the average yield by 10%. The variety Hashiri-Bozu, bred by the Hokkaido Agricultural Experiment Station from a cross between the early varieties Sakijake and Bozu, was distributed in 1923, and resulted in a further increase in the rice growing area. In 1937, Norin No. 11, the earliest-maturing rice so far produced, was distributed as a result of the co-operative work of the Imperial and Hokkaido stations.

As in the case of wheat, the local adaptation of varieties has received considerable attention. The early distribution of hybrid generations is extensively practised, with a procedure essentially similar to that described for wheat.

The report states that special experiment stations or facilities exist for the study of the following problems: (1) the response of varieties to unseasonably low temperature; (2) varietal reaction to cold water; (3) the effect of deficient sunshine on yield and on different varieties; (4) selection for resistance to *Piricularia* in special environments favourable to the disease; (5) the effect of deficient water supplies on yield and different varieties, the study of which is made possible by provisions for raising and lowering the water table; (6) the response of varieties to length of day; and (7) varietal resistance to the rice borer.

1333. 575:633(54)

Annual report of the Department of Agriculture in the Province of Bombay, 1945–46 (1947) : Pp. 50.

Wheat

Pure seed stocks of the standard improved strains of dry land wheat, Jaya, Vijaya, Motiya and Gulab, and the irrigated variety Niphad–4 are being maintained at the Cereal Breeding Station, Niphad. Niphad–4 is becoming an important variety on account of its high baking quality and rust resistance. Promising selections from local irrigated wheats, such as Bakshi and Mondhya, are under trial. Hybridization between standard strains has yielded valuable selections, particularly as regards grain quality. Breeding for rust resistance is also in progress; hybrids between local improved wheats and foreign resistant types are under test for rust resistance and other characters. Work on the improvement of the irrigated varieties, Bakshi and Khapli, cultivated in Deccan Canal tract, has been begun at Padegaon. Breeding work on red hard wheats is being carried out at Bijapur. A station has been recently established at Arnej with a view to developing improved varieties

for the Bhal tract of Gujarat. Promising selections have been secured from local varieties; Gulab has been crossed with Niphad–31 to improve the former strain.

Maize
Hybrid production is receiving attention.

Sorghum and millets
The development of dual purpose sorghum for the Deccan Canal tract is the chief aim of investigations at Padegaon. Sorghum for cultivation during the rabi or winter season in the eastern dry zone of Bombay Province is being developed at Bijapur and Mohol. The improved Maldandi strain, M–35–1, is being multiplied. In order to improve the fodder quality of this strain it has been further crossed with fodder varieties from Africa and the Punjab. Improved strains of bajri (*Pennisetum typhoideum*) have been developed. The possible use of heterosis in bajri is being explored.
Promising selections of nagli (*Eleusine coracana*), vari (*Panicum miliaceum*) and kodra (*Setaria italica*) are being produced.

Rice
Improvement of non-scented varieties is in progress at Karjat, while the improvement of scented varieties is the main objective of work at Vadgaon and Igatpuri. The Panwel Farm has recently been established with a view to breeding superior varieties for salt land cultivation. The development of improved strains for the different districts is also being carried out at Kumta, Mugad, and the recently established stations at Bulsar in the Surat district and Nawagam in Kaira.

Cotton
A summary of breeding investigations has previously appeared (cf. Abst. 322).
The "small leaf" disease causing sterility and reduction in leaf size in Rozi cotton cultivated in the Kaira district and Mungari cotton grown in Madras Province and Hyderabad State has been found to be of virus origin.

Tobacco
The improved strain S–57 has proved economically superior to the local variety in tests at Nadiad, Kaira, and is now available for distribution. Selections of Piliu are under trial for yield and leaf quality. Among the various combinations being studied for heterosis the cross K–49 x S–57 has given consistently higher yield than the parents; an attempt is being made to develop a cheap method of producing F_1 hybrid seed.
Work at Nipani, in the Belgaum district, is concentrated upon the improvement of cigarette tobacco. Promising selections of local Surti varieties are under extensive trial. Hybridization involving Harrison's Special, Bonanza and White Burley is in progress.

Chilli
Selection of local varieties has been begun at Hirekerur, in the district of Dharwar.

Oil Crops
Improvement of linseed, sesame, safflower and niger (*Guizotia sp.*) is in progress.

Vegetables
Selection of onion, sweet potato and other vegetables is being carried out at Poona and Padegaon.

Pulses
High yielding strains of gram (*Cicer arietinum*), mung (*P. radiatus*), tur (*Cajanus indicus*) and other pulses have been selected, and are to be tested in large scale yield trials. Wilt resistance in gram and tur is receiving attention. The improved gram strain Chaffa gives high yields of large yellow grain; it is now being multiplied at various centres. The early grain strain Gulab, particularly suitable for parching, is being multiplied on a small scale; it is lower yielding than Chaffa but the strain is expected to fetch a higher price on account of its superior parching quality.
Three strains of *Lathyrus sativus*, Indore T–2–1, Indore T–2–12 and Poona S–1, have proved wilt resistant at Haldar in the Broach district, and superior to the local variety in yield and other characters; their only defect is slightly late maturity.

1334. 575:633:(54)

30th Anniversary of the Bose Institute.

Sci. and Cult. 1948 : **13** : 284–85.

Reference is made to the plant breeding work of the Bose Institute. This has included selection of suitable types of cotton and jute, hybridization, and the production of new strains by X-irradiation. Long stapled, disease resistant and early maturing cottons suitable for cultivation in Bengal have been obtained. Unusually tall jute plants with a large basal diameter have been produced by X-irradiation. Rice breeding has been going on for several years. It is expected that the co-operation of the Institute with the Department of Agriculture may help West Bengal to become self-sufficient for cereals and other economic plants. The cytogenetics of different species of *Cinchona* is being investigated.

1335. McDonald, J. 575:633(56.4)

Annual Report of the Department of Agriculture Cyprus for the year 1946.

1947 : Pp. 12.

Cereals

Locally bred hybrid selections and introduced varieties of wheat and barley were tested but few gave a better performance than the standard varieties of Cyprus.

Potato

In trials of new varieties from Northern Ireland, the standard variety cultivated in Cyprus, Up-to-Date, maintained its performance as the best variety under local conditions. Ulster Commerce, however, compared well with Arran Banner, the next best variety in Cyprus.

Tobacco

Investigations were carried out on the alleged poor quality of the yellow-leaved tobacco of Cyprus with a view to its improvement, and on the possibilities of growing Virginia tobacco. Progenies from single plant selections of yellow-leaved tobacco have yielded an extremely varied range of types.

Sesame

In a trial of two locally selected strains, that with tetralocular pods gave a 10% higher yield than the other, a bilocular type; this superior character of the former was, however, partly offset by the greater development of branching in the latter.

Fruits

Trials of apples, pears, plums, cherries, peaches and nectarines have indicated the most suitable varieties for the hill villages. Trials are now being conducted to provide information on the best varieties for cultivation at the lower altitudes.

At the Famagusta Citrus Station the production of early varieties of tangerine and late varieties of orange is receiving attention.

Trials of American *Phylloxera* resistant root stocks are in progress at the Viticultural Station, Saitta.

1336. 575:633(67.5)

Rapport pour les exercices 1944 et 1945. (**Report for the years 1944 and 1945**).

Publ. Inst. Nat. Agron. Congo Belge 1947 : Pp. 191.

Pyrethrum

Eighty new crosses have been effected, and previous crosses subjected to tests. The productivity and chemical composition of élite clones were determined. Plants which developed from colchicine-treated seeds produced larger, heavier seeds, and flowers with a higher pyrethrin content than the corresponding diploids.

Maize

The introduction of 13 new varieties is reported.

Crosses have been made between plants in the collection and the local variety Turumbu in order to obtain a variety with a vegetative period of not more than 92 days.

Yield tests were carried out at the Nioka station.

Hybridization, selection and comparative tests at Gandajika are reported.

At the Rubona station, Hickory King yielded better than introduced varieties.
Selections Kisosi 44 and 45 at the Kisosi station have far outyielded the original material compared with which their quality has also improved.

Millet
Selection is reported.

Sorghum
Comparative tests were effected at the Gandajika station.

Rice
Numerous varieties have been introduced from other countries.
Hybridization work was carried out in 1945. Four varieties were included in a comparative test at Bambesa.

Coix Lachryma-Jobi
Three new varieties of *Coix* have been introduced. The technique of crossing is described.
Twenty-six varieties were included in yield tests, and mother plants have been selected for high yielding capacity.

Potato
Blight-resistance trials at Mulungu are reported.
In the Eastern region, Kisosi 59, 38 and 15 proved most resistant to diseases.

Sweet Potato
Three new varieties have been added to the collection.
The conditions favouring flowering and fruiting were studied; emasculation should be effected in the evening since anthesis occurs between 4 and 5 a.m.
Fifty-one clones were included in yield tests at the Nioka station.
At the Mulungu-Tshibinda station, plants were tested for virus resistance. Crosses were attempted between *Ipomaea cairica* and *I. Batatas*. The variety Mulungu 46 showed a distinct superiority in production over all the other varieties. Virovsky is established as an élite; Cardine Leaf, Mugenda, Red Brazil and 85·986 are cited as good varieties.
American Florida White was the highest yielding of 39 varieties tested at Rubona.
Of 13 introduced varieties at the Kisosi station, Porto Rico 334, Norton Sam and Algérienne greatly exceeded the local varieties in yield and quality. Selection is in progress.

Cotton
Tests at Bambesa of resistance to *Fusarium* wilt showed that varietal resistance is maintained in successive years. Arkansas 17 and B.P. 52 proved highly resistant, and Stoneville 5A, Stoneville 04, Gar. 32 and 33, and Lubarika 34 exhibited good resistance to the disease. From the plants tested, 235 were picked out as resistant. The F_4 generations of four hybrids included resistant plants. Selection for resistance was continued, and new hybridizations are being carried out between the resistant selections and lines of economic interest.
At Bambesa, partially and totally self-fertilized lines have been under observation. The chief characteristics of some élite families and yield data for élite varieties are tabulated.
Hybrid lines with Stoneville as one parent have been obtained by natural and artificial crossing. The object of hybridization is to improve Stoneville, the best of the existing varieties, especially as regards ginning out-turn, by back-crossing. The fibre length, ginning out-turn and number of capsules of the most interesting hybrids are tabulated.
The chief aim in crossing Stoneville with D.P.L. 11/A is to fix *Fusarium* wilt resistance.
Back-crosses of H63 to Stoneville and Half and Half tend to combine good fibre length with high ginning out-turn. The observation of 25 foreign varieties continues; 35 mother plants have been selected during the year. In general, the fibre length is less than in the countries where the varieties originated. Various hybrids are being studied.
Selection at Gandajika is reported and the characters of the chief families in course of selection at this station are tabulated. Crosses between multiple hybrids obtained in 1944 and Gar. 33 have been attempted. Comparative tests are reported at this station and at Boketa.
Selection, hybridization and comparative tests were continued at Lubarika.

Urena lobata
Progeny tests are reported. The choice of mother plants has been limited to the two varieties Luozi and Madimba, which have proved superior to the rest.

Sisal
Varieties of blue sisal and of *Agave sisalana* were included in a comparative test.

Manioc (*Manihot utilissima*)
Study of the conditions favouring anthesis indicates, so far, that the optimum relative humidity is 67% to 75% and that anthesis takes place between 11 a.m. and 1 p.m.
In September 1944, 148 crosses were made, seedlings from which were planted out for study in 1946. Among the élite clones tested, 23 have been retained.
Tests for mosaic resistance are in progress.
At Gandajika, varieties in the collection have been classified according to their toxicity, and comparative tests have been carried out.
Uganda outyielded 16 other varieties at Rubona.

Yam (*Dioscorea*)
The yield of certain varieties averaged 23 kg. per ha.

Coffee
Twenty lines of *Coffea arabica* are to be tested at Mulungu for resistance to various diseases.
Selection of mother trees and yield tests of progenies are reported. The vegetative clones are divisible into three groups: self-fertile ones; those in which the production is depressed by about 50% by self-fertilization; and those which are virtually self-sterile.
Yield data for different varieties are presented. Mulungu lines have been included in tests.
The reactions of different varieties to an outbreak of *Colletotrichum* at the Mulungu-Tshibinda station are described. The most productive of the hybrids planted out at this station are B.M.K. 3 x B.O. 72 and B.M. 137 x B.M.K. 3. At Bambesa, L 51, Locale [Local], L 136, L 120, L 52 and BP 42 proved most productive.

Cacao
Mother trees have been selected on the basis of productivity, qualitative characters and earliness. Trials of various progenies are reported.
Forastero types and hybrids are under observation at Kondo.

Aleurites
Hybridizations between *A. montana* and *A. Fordii*, and self-fertilization of élite No. 541 are reported.

Oil palm
Selection work is reported. Hybridizations have been effected with the aim of producing improved seeds. The yields of different clones at Yangambi are recorded.

Cinchona
Mother trees have been selected at the Mulungu-Tshibinda station on the basis of vegetative vigour and high content of quinine sulphate.
Clone 143 has been chosen as a standard clone because of its homogeneity. Clones 228, 278 and 69 were remarkable for their vigour, and lines 145, 142, 123 and 141, planted in 1939, continued to show their superiority. The progenies of six crosses between élite clones are under test. Their homogeneity is very pronounced. Twelve potential mother trees were subjected to a grafting test.
In a population of *Cinchona Ledgeriana*, the percentages of trees bearing long-styled and short-styled flowers were about equal. Clonal differences in the morphology of the flowers, etc., have been investigated. The dimensions of trees of different varieties during the period 1937–1945 are compared.

Hevea
Performance data for different clones are presented.

Citrus fruits
Varietal tests at Vuazi are reported.

Groundnut
Thirty-three varieties have been introduced from various parts of the world.
Research on the most favourable time for pollination has shown that the time of anthesis is determined by the humidity of the atmosphere. Forty-six crosses have been effected, mostly in 1945, between especially productive, hardy plants with fruits rich in oil. Mother plants have been selected from the progenies of both artificial and natural hybrids.
Different varieties were tested against A. 20.
Selection work has been continued at Gandajika and comparative tests effected.

Banana
Eight new dessert varieties and eight new plantains were introduced in 1945.
Various varieties have been submitted to comparative tests.

Bean
Varities of various *Phaseolus* species have been added to the collection.
Study of the floral biology of *Ph. angularis* shows that pollination should be effected during the night.
Choice of mother plants was based on seed weight.
Comparative tests of *Ph. vulgaris* varieties are reported at the Nioka station.
The results of disease resistance tests at the Mulungu-Tshibinda station are described.
In comparative tests at the Kisosi station and in local trials carried out for 11 seasons, the Kisosi lines have yielded 140% of the yields of local varieties. The best lines are 0538 (Mixed Mexico), 0652 (Colorado) and 2826 (Large White).

Soya bean
The introduction of new varieties is reported.
Anthesis occurs between noon and 2 p.m. in dry weather and is retarded by one hour in the rainy season. The technique of crossing is explained.
Varietal tests are reported. At Rubona, Otoxi and Palmetto were the best among 30 varieties as regards yield.

1337. 575:633(67.61)

Annual Report of the Department of Agriculture, Uganda Protectorate, for the period 1 July, 1945–31 March, 1946.
(1947) : Pp. 92.

Eleusine
New introductions from Northern Rhodesia, Kenya and India have been tested at Serere but they do not appear to be superior to the standard varieties. The possibility that "Ekitu" is *E. indica* growing as a weed in the *E. coracana* crop is being explored through an investigation of the chromosome number. Standard varieties from Serere were compared with local Buganda seed at Kawanda; Engenyi and Ekwahoit gave the highest yields; the former variety was also the highest yielding at Serere.

Setaria italica
In varietal trials at Serere, Sio again gave the best yield.

Sorghum
Varietal resistance to *Sphacelotheca Sorghi* has been investigated at Serere. Approximately 20 varieties were classed as resistant.

Forage Species
The following local grasses have shown promise for pastures at Kawanda: *Brachiaria brizantha, B. decumbens, Chloris gayana, Cynodon plectostachyum, Echinochloa pyramidalis,* and *Hyparrhenia rufa.* The introduced grasses *Paspalum dilatatum* and *Setaria splendida* have also given good results. *Stylosanthes guianensis,* a legume introduced from Australia, is considered to be worth further trials as a component of mixed pasture.

Cotton
Breeding and selection are reported (cf. Abst. 321).

Cassava
Mosaic resistant varieties are under trial.

Coffee
Data are given on the yields of erect and spreading selections of *Coffea robusta* growing at Kawanda. In the older plots, the erect types were more productive in the first eight years, but in the last three seasons the spreading types have given the better yields. In trials of *C. arabica* varieties at Kawanda Kent's Arabica has given a yield nearly double that of the other varieties.

Cinchona
Mother tree selection is in progress at Kawanda. *C. Josephiana* is under observation at the Kyembogo and Kachwekano farms in the Western Province.

Groundnut
Varietal trials have been carried out.

Phaseolus
Trials of Canadian Wonder, Abundance and other varieties were carried out at several locations.

Soya bean
Varietal tests are reported.

1338. 575:633(68)

Annual report of the Department of Agriculture for the year ended 31 August, 1947.
Fmg S. Afr. 1947 : **22** : 917–1184.

Wheat
New combinations between parents with high yielding capacity and disease resistance are shortly to be tested at the Potchefstroom College of Agriculture. *Triticum-Agropyron* derivatives have also reached the testing stage; this group is more promising as a source of selection for disease resistance than the hybrids obtained from wide crosses of wheat varieties. In this breeding work particular attention is being given to blight resistance. Investigations at the Stellenbosch-Elsenburg College of Agriculture include breeding for resistance to rust and foot rot, and experiments on colchicine-induced amphidiploids of wheat x rye and *Agropyron* x *Triticum* crosses. The baking quality of the rye x wheat hybrids is shortly to be tested.

Oats
Breeding has been begun at Potchefstroom. Selections are under test for resistance to crown and stem rust at the Stellenbosch-Elsenburg College of Agriculture.

Rye
Inbreeding is being carried out at the Stellenbosch-Elsenburg College to eliminate undesirable characters and maintain purity of type.

Maize
Further progress is reported in the development of a yellow variety similar to Early Potchefstroom at the Agricultural Research Institute, Pretoria. In the programme of hybrid production inbreeding has been begun; special attention is being given to yellow maize.
Breeding for resistance to streak is reported.
The programme of hybrid production of the Potchefstroom College of Agriculture continued. It cannot be expected, however, that double hybrid seed will be available to producers in any considerable quantity before 1949.

Sorghum
Broom corn breeding is in progress at the Agricultural Research Institute.

Kaffir corn
Breeding at the Potchefstroom College of Agriculture is mentioned.

Forage plants
Grasses, legumes and fodder trees are under trial in different regions.
The perennial fodder species, *Setaria Kazungula* and *Glycine javanica*, grown together,

have given good hay crops at Rietvlei. *S. Kazungula* has also given promising hay yields at Dohne.
Hybridization work on millet grass is reported from the Potchefstroom College of Agriculture. *Setaria* breeding is to be carried out.
Lucerne breeding is in progress at Upington.
Selection of lupin is being carried out at the Stellenbosch-Elsenburg College. Lupins have become popular as cover and fodder crops.
Velvet bean varieties specially bred for hay production have given good results at Rustenburg and Hartebeespoort.
Cowpea breeding is in progress at the Upington Station and the Potchefstroom College of Agriculture.
A fodder type of kale has been obtained at the Stellenbosch-Elsenburg College which is high-yielding and does not run to seed too early; further selection for uniformity is in progress.

Potato
Among the seedlings introduced from foreign potato breeding institutes and tested by the Division of Botany and Plant Pathology, promising varieties have been obtained with resistance to *Phytophthora* blight and wart. One line from the Commonwealth Potato Collection has proved highly resistant to *Alternaria Solani*. Crossing between introduced and local varieties has been begun.
The Potchefstroom College of Agriculture is also carrying out breeding work, particularly with material from the Commonwealth Potato Collection, in collaboration with the Division of Botany and Plant Pathology and the Riet River Experiment Station.

Cotton
Selection and breeding are being carried out at Upington.

Maranta
Selections at the Agricultural Research Institute were transplanted and inbred with a view to obtaining desirable types.

Tobacco
Breeding at Rustenburg includes varietal selection and intervarietal hybridization of flue-cured tobaccos. Resistance to mosaic and eelworm is being sought.

Fruits
Investigations on grapefruit at the Citrus Research Station, Addo, suggest that stem-pitting disease is probably due to a virus. Attempts are being made to secure trees free from or at least resistant to the disease by budwood selection and other methods.
It appears that virus disease is responsible for the incompatibility of certain grafts of *Citrus* species in South Africa. This problem has been overcome by seed propagation, using the principle of nucellar embryony. By this technique almost any graft union of *Citrus* species can be made to grow normally.
A large number of introduced *Citrus* species and varieties are under test for their adaptability to South African conditions at the Nelspruit Research Station. This material also provides a basis for selection and breeding. A large number of strains of the Navel orange are grown in the Union, some of which differ so markedly in quality and other characteristics that they could justifiably be given distinct names.
Varietal collections of avocado, mango and other subtropical fruits are under observation at Nelspruit.
Breeding of table grapes, peach, apple, guava, strawberry and other fruit continues at Bienne Doone, Groot Drakenstein.
Selected strains of the canning peach Kakamas are under test at the Upington Station, which have the advantage of ripening at different times.
Introduced pineapple varieties are under test at Bathurst, many of which are similar to the local varieties Queen and Smooth Cayenne. The Australian varieties Cayenne Zuill and Cayenne Q.A.S. are bearing fruits with a single crown, this being an improvement over the South African Smooth Cayenne which bears about 50% of its fruits in double or multiple crowns. Of the imported Queen types, only Ripley shows promise of superiority

over the South African Queen. Valuable seedlings of crosses between Queen and Smooth Cayenne are under trial at Bathurst and Nelspruit.

Groundnut
Breeding is in progress at Potchefstroom.

Vegetables
Inbreeding is being effected by the Division of Horticulture in the carrot, beetroot, spinach beet, tomato and eggplant, in order to study the inheritance of important characters, and the extent to which inbreeding can be pursued without seriously affecting quality. The breeding programme also includes the recombination of inbred lines to maintain or improve vigour, quality and uniformity. Valuable types of carrot, spinach beet, eggplant and tomato have already been secured from the first and second inbred generations. In addition, collections of varieties and types of carrot, beetroot and tomato have been established with a view to obtaining useful natural hybrids for inclusion in the work of inbreeding and recombination of inbred lines.
Breeding at the Stellenbosch-Elsenburg College includes parsnips, carrots, tomatoes, onions and other vegetables.
Progress in the development of promising onion selections is reported at the Agricultural Research Institute, Pretoria.
Tomato breeding work at Nelspruit and Pretoria has resulted in the production of new strains resistant to bacterial wilt and *Fusarium* wilt.
Pea crossing has been carried out to develop earlier, better adapted varieties for the semi-tropical conditions of the low veld of eastern Transvaal.
The bacterial wilt resistant beans, Black Wonder and Black Valentine, which are poor in quality, have been crossed with varieties of high quality, with a view to combining wilt resistance and high quality, in investigations by the Division of Horticulture.
Soya bean breeding is being carried out at Potchefstroom.

1339. 575:633(71)

Report of the Minister of Agriculture for the Dominion of Canada for the year ended March 31, 1947 : Pp. 257.

Wheat
In the spring wheat investigations of the Cereal Division breeding for resistance to spring frost has been begun. A selection from the cross Reliance x R.L. 729 shows outstanding frost resistance and is being used as a parent. It is hoped to combine frost resistance with early ripening and high quality in order to develop a variety especially suited to certain districts in northern Canada.
An attempt is being made to develop a low-protein, white spring wheat for cultivation in western Canada to meet the need for pastry flour.
Winter wheat breeding aims at the production of rust resistant varieties for Ontario and Alberta.
Breeding for resistance to the new race 15B of stem rust is in progress at the Laboratory of Cereal Breeding, Winnipeg. This race has occurred in the United States; although it has not yet occurred in Canada it is capable of attacking all the present commercial varieties, including the new Redman variety (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 17).
Work is also being carried out at the Laboratory of Cereal Breeding to develop wheats of the Redman type with resistance to loose smut and with solid stems, Thatcher being used to breed for the former character and Rescue for the latter.
Durum breeding at the Laboratory aims at producing earlier maturing, disease resistant, higher yielding varieties with shorter and stronger straw.
More virulent biotypes of several races of leaf rust are now more common in Manitoba and Saskatchewan than the less virulent forms; breeding material showing resistance to the new strains is available.
Triticum vulgare varieties were tested in Manitoba for their reaction to common root rot, due to *Helminthosporium* spp. and *Fusarium* spp.; several new varieties proved resistant. In tests of resistance to root rot at Saskatoon, Thatcher showed heterogeneity with regard to resistance, suggesting scope for selection.

Oats

Race 8 of stem rust constituted 30% of the infection occurring on oats in Manitoba and Ontario during 1946. The new variety Garry (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1410) is resistant to race 8 and all other known races of stem rust of oats, and also to crown rust, loose and covered smuts.

In Manitoba varieties were tested for their resistance to common root rot (*Helminthosporium* spp. and *Fusarium* spp.); several new varieties exhibited resistance.

Marked differences were observed in varietal susceptibility to grey speck, a disease due to manganese deficiency of the soil. Most but not all varieties derived from crosses involving Victoria were highly susceptible.

In breeding for disease resistance at the Laboratory of Cereal Breeding, Winnipeg, hybrid selections resistant to all races of stem rot, crown rust, smut and halo blight have been secured.

Maize

Progress is reported in the production of hybrids for grain and silage by the Division of Forage Plants.

Hybrid production is in progress at Harrow, Ontario. Harvic 300, a medium maturing maize, is the first Canadian hybrid to be produced on a commercial scale.

Morden 56, a hybrid between flint and dent lines, gave an outstandingly high yield. Two Morden hybrids of the dent type were comparable to Falconer in season and yield, but more suitable for mechanical harvesting.

Barley

The new Vantage barley has been developed and increased (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 981). Vantage has been crossed with Titan and Velvon with a view to incorporating smut resistance.

Tests have been carried out on varietal resistance to common root rot (*Helminthosporium* spp. and *Fusarium* spp.).

Forage grasses

Cyto-taxonomical studies are being carried out on *Agropyron* spp. collected in Canada. Diploid and tetraploid races have been found in *A. spicatum*, and tetraploid and octoploid races in *A. Smithii*. All the plants of *A. dasystachyum* and *A. trachycaulum* so far examined are tetraploid, while those of *A. repens* have been found to be hexaploid. Preliminary results indicate that both *A. trachycaulum* and new undescribed species from the Yukon River area are self-fertile.

Amphidiploids have been obtained from crosses of Vernal emmer, *T. turgidum*, Kharkov, Akrona, Kubanka, Mindum, Khapli and Pentad with *A. glaucum*. Lines selected from crosses of wheat with *A. elongatum* were found to be comparatively stable after six to eight generations. Continuous selection for increased fertility and seed weight has resulted in lines similar in these respects to wheat. While superior to amphidiploid strains in seed characters these lines yield less fodder.

A leafy hay type of timothy is under final trial by the Division of Forage Plants. The development of a late maturing strain of timothy is in progress at Nappan, N.S.

Russian wild rye shows promise as a pasture grass at Brandon, Man.

An inbred strain of Fairway crested wheat grass, S–31–6, has shown outstanding survival and yielding ability in comparison with other varieties and strains at Melfort, Sask.

Forage legumes

The new lucerne variety, Canauto, selected for high seed yield, compares favourably with Grimm as regards hay yield. Investigations on the production of double cross lucerne hybrids resulted in the selection of highly self-sterile plants from Ladak; the combining ability of these lines is being studied.

At Saskatoon lucerne breeding for a higher degree of winter hardiness in combination with bacterial wilt resistance is in progress; crown rot resistance is also receiving attention. Resistance to these two diseases is also being sought at Lethbridge, Alta.

Back-crosses of Siberian lucerne to Ladak x Siberian hybrids show promise of providing useful breeding material at Swift Current, Sask.

Alsike clover from indigenous Canadian sources has shown superiority over introduced varieties as regards vigour and hardiness in investigations by the Division of Forage Plants. Alsike and red clover breeding is being carried out at Saskatoon.
Clones of Ladino white clover selections are under field test by the Division of Forage Plants.
A new early ripening, large-seeded field pea variety, developed at Ottawa, has continued to give a good performance; the variety has been increased for distribution.
A high yielding, early maturing field bean selection from the cross Beauty x Burbank has given promising results.

Root crops
Mangel breeding for high yielding capacity and high dry matter content was continued by the Division of Forage Plants. Lines and selections of the Tip Top mangel were tested. Breeding for club root resistance in swedes is in progress. The most resistant swede varieties, such as Wilhelmsburger and Danish Giant, have been crossed with highly resistant turnips.
Club root resistance in swedes is also receiving attention at Nappan, N.S.; information is being obtained on the inheritance of the quality of resistance and on breeding techniques.

Potato
Tubers of lines from the Commonwealth Potato Collection are under test for resistance to bacterial ring rot. The American variety, Teton (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 749), has been found highly resistant but not immune.
Two seedlings tested at the Fredericton Experimental Station have shown no leaf-roll symptoms during a four-year period. The foliage and tubers of some seedlings derived from the cross *Solanum demissum* x *S. tuberosum* have shown late blight immunity. Hybrid seedlings highly resistant to common scab have also been secured at Fredericton.

Flax
Crossing fibre varieties with disease resistant linseed types and back-crossing to fibre varieties offer possibilities of developing disease resistant flax varieties.
Selections of Viking linseed with a greater straw length have been obtained at Brandon, Man.

Sugar beet
Breeding has been begun at Lethbridge, Alta.

Tobacco
The resistance of burley varieties to brown root rot is receiving attention at St. Catharines, Ontario.
The new cigarette burley variety, Harmony, has been released by the Harrow station, Ontario; the variety is resistant to black root rot. Several new flue-cured strains being developed show black root rot resistance and superior quality of the cured leaf. New dark tobacco strains are also being produced.

Taraxacum Kok-Saghyz
Hybridization and selection were continued in the attempt to secure a vigorous uniform strain with high rubber content. Line 93·24 has shown particular promise as a parent. A large number of lines tend to be incompatible; this incompatibility shows no decrease in tetraploid material. Hybrids from the cross *T. Kok-saghyz* x *T. latilobum* are under investigation.

Tree fruits
Apple seedlings 0–272 and 0–277, derived from a cross between Crimson Beauty and Melba, show promise as regards earliness and fruit characteristics.
The hybrid *Prunus Besseyi* x Burbank, formerly designated 0–302, was named Algoma by the Division of Horticulture. It appears to be one of the best green-fleshed sand cherry hybrids so far developed.
The plum seedlings Morden 124 and Morden 125 are to be distributed by the Morden station, Man. Morden 124 (U–10–10) is a cherry plum derived from the cross Brooks x Sapa. The fruit is roundish, about one inch in diameter, sweetish, and suitable for dessert and canning. Morden 125 is a seedling grown from seed of *P. salicina* collected in western

China. The fruit is pale yellow, one and a quarter inches in diameter, and mild in flavour. The tree is hardy.
Dwarf bush cherries (*P. fruticosa*) introduced from Mongolia were not adversely affected by fluctuations in the temperature during spring in tests at Morden. The fruit is variable in size and flavour, but even the poorer types are suitable for jelly.

Strawberry
Burgundy x Valentine seedlings show promise in respect of vigour, productiveness, fruit size and resistance to foliage diseases at Morden.

Melon
Breeding for *Fusarium* wilt resistance has been begun, on account of the serious losses in south-western Ontario due to the disease.

Soya bean
Breeding is in progress at the Harrow station.

Sweet corn
The new Sugar Prince hybrid, produced from the cross Sunshine x Burbank Golden Bantam, was introduced by the Morden station. It is an early hybrid, with large ears of 12 to 14 kernel rows and the high quality of Golden Bantam; it should prove valuable to the canning and freezing industry.

1340. 575:633(72.95)
Report of the Federal Experiment Station in Puerto Rico 1946.
U.S. Dep. Agric. 1947 : Pp. 55.

Insecticidal plants
Cuttings of superior MG clones of *Derris elliptica* were distributed for trial in Guatemala, Dominica and Cuba. The rate of root elongation in *Derris* has not been found to be correlated with rotenone content. Type of cutting planted has no influence upon rotenone content. Toxicological experiments on varieties of *D. elliptica, Lonchocarpus utilis* and *L. chrysophyllus* have revealed that toxicity is not necessarily proportional to rotenone content. Other constituents therefore appear to contribute to insecticidal value. The following species were tested for their insecticidal properties: *Albizzia stipulata, Aleurites trisperma, Balanites aegyptiaca, Caladium* sp., *Clibadium erosum, Clusia rosea, Commelina elegans, Dieffenbachia Seguine, Erythrina* sp., *Piscidia piscipula, Solanum ciliatum* and *S. nigrum.*

Pennisetum
Napier grass (*Pennisetum purpureum*) has proved superior to F_1 hybrids between *P. purpureum* and *P. glaucum* introduced from Georgia.

Coffee
The variety Columnaris (*Coffea arabica*) from Java is superior in yield to the Porto Rican variety.

Cinchona
The species and strains established in field plantings during 1945 are listed. Cuttings from young seedlings showed a better rooting capacity than cuttings from older trees. The thalleoquin reaction has been used as the basis of a method of testing for quinine content; the technique requires only 2 grm. samples of bark (cf. Abst. 1131). The method is not however satisfactory for determining small quantities of quinine. A spectrophotometer method is described, which requires small samples of bark and can be used to determine small amounts of quinine. This method is particularly useful in the selection of *Cinchona* seedlings.

Avocado
Late varieties have been studied in a plantation near Guayanilla. Winslowson, which is a hybrid between the Guatemalan and West Indian races, Las Mesas 122, Panchoy, Itzamna, Dickinson, Manik, Tumin and other varieties are recommended for further trial.

1341. 575:633(72.98)

Annual report on the Agricultural Department, St. Vincent 1946 (1947) : Pp. 29.

Maize
The local strain was mass-selected. A strain known as Sahara maize and a strain from Trinidad are under observation. Trials of hybrid maize introduced from the United States are in progress.

Cotton
Further selection is to be carried out only on VH.8 material (cf. Abst. 321).

Sweet potato
Several local varieties have given as good results as improved varieties from Barbados.

Sugar Cane
Barbados varieties are being propagated and distributed.

Arrowroot
Rhizomes of the variety Creole were selected for number of internodes, shortness of internode and diameter, with a view to increasing yield. These selections are being propagated as clones to provide material for replicated small plot trials.
Botanical studies are being carried out to study the behaviour of plants grown from various types of material, with the object of securing information on the origin and nature of the "cigar" kind of rhizome poor in starch content. It has been observed that the material shows considerable differences in general vigour and yield of rhizomes.

Yam
A collection of types was maintained.

Tobacco
Varietal trials continued. The leaf so far obtained has proved suitable for pipe and cigar tobacco, but not for the manufacture of cigarette tobacco.

Cacao
The propagation of clonal material from Trinidad is reported.

Soya bean
Trials are being carried out to find a satisfactory edible variety for increasing the protein content of the local diet.

1342. 575:633(72.98)

Administration report of the Director of Agriculture, Trinidad and Tobago for the year 1946 (1948) : Pp. 28.

Sugar cane
Varietal trials are briefly reported.

Cacao
Witches' broom resistant clones of local and South American origin were propagated at Marper Farm. Budded plants of a new clone from Surinam (C.C.7) were established. The clone is high yielding and has shown resistance in Surinam to witches' broom. An attempt is being made to develop a technique for fermenting small quantities of cocoa which compares favourably with the method of bulk fermentation in the sweat box, and which will be useful in the testing of clones.

Coconut
Interest in coconut cultivation had been stimulated by increases in the price of copra. A scheme for improving the seed nuts by careful selection has been proposed by the Department of Agriculture; several planters are now searching for high yielding palms.

1343. 575:633(74.1)

The Maine Agricultural Experiment Station, Orono. Report of progress for year ending June 30, 1946.
Bull Me Agric. Exp. Sta. 1946 : No. 442 : 117–316.

Field bean
Breeding work to develop a desirable Yellow Eye type of field bean resistant to anthracnose was continued.

Potato
New seedlings resistant to bacterial ring rot have been secured, and are to be tested for yielding ability, quality and other characters. Many of the seedlings are also resistant to late blight. A high percentage of ring rot resistant seedlings has been derived from crosses in which President and Nos 336–18, 336–144, 0.55, 46952 and 47102 (Teton) have been used as parents. Breeding for leaf roll resistance is in progress.

Vegetables
Investigations are reported on the vitamin C content of fresh and processed samples of tomato, pepper and other vegetable varieties. Cucumber breeding for scab (*Cladosporium cucumerinum*) resistance is reported. Maine No. 2, a highly resistant variety, was released in 1939, but its type and colour are not entirely satisfactory for commercial use. Highmoor, a new scab resistant variety of the slicing type, has been produced to meet the requirements of market growers. It was produced by crossing a scab resistant breeding stock with Straight 8 and back-crossing to the latter for several generations. Highmoor resembles Straight 8 in type and season. Work is being carried out to determine whether scab and mosaic resistance can be combined in a single variety.
In breeding shell beans resistance to halo blight is receiving attention. Artificial inoculation tests were carried out during 1945 in field plots of many varieties and also progenies from crosses between resistant selections of Red Kidney and varieties possessing some degree of resistance. The varieties Hidatsa Red, Robust, Hercules, Selection 400, Dunning Pea, Chain Lightning and Lapin exhibited resistance. Low's Champion has been crossed with several relatively resistant varieties with a view to developing a halo blight resistant bean of the Low's Champion Type.
Sweet corn breeding includes the production of yellow and white hybrids for canning. It is hoped that suitable white inbred lines can be developed by the method of convergent improvement.

1344. 575:633(74.1)

The Maine Agricultural Experiment Station, Orono. Report of progress for year ending June 30, 1947.
Bull. Me Agric. Exp. Sta. 1947 : No. 449 : 261–505.

Maize
Several new hybrids appear to be promising for conditions in Maine. KF 1, KF 5, Mass. 62 and Cornell 29–3 have shown particular promise in varietal trials.

Field bean
The work of developing a Yellow Eye type of field bean resistant to anthracnose was continued. Promising selections obtained by crossing Yellow Eye with pea beans and Johnson are now under trial for yielding capacity.

Potato
In breeding for ring rot resistance it has been found that progenies derived from Teton (No. 47102) contain a higher percentage of resistant seedlings than those derived from No. 46952. Selfing a resistant variety and crossing two resistant varieties both resulted in an increase in the percentage of resistant seedlings in the progeny. The variety Erie (No. 47101) which was derived from the same cross as Teton, also appears to possess ring rot resistance. Breeding for leaf roll resistance continued. A number of hybrids were tested and re-tested at Aroostook Farm for resistance, the method of inoculating by means of virus carrying aphids being used. It is considered that this method is more severe than the technique of field exposure. Resistant seedlings have been secured; they are to be used in selfing and further hybridization. It is noted that Triumph is of considerable value as a parent in breeding for leaf roll resistance. At Highmoor Farm a large number of seedlings have been subjected to leaf roll resistance tests under field conditions. Seedling 1276–185, from a cross between Katahdin and Houma, shows particular promise as a desirable leaf roll resistant potato, comparing favourably with Chippewa in several respects. Some resistant seedlings have shown immunity to mahogany browning in cold storage.

Strawberry
New hybrid selections are under observation at Highmoor Farm.

Vegetables
Further analyses of the vitamin C content of tomato and other vegetable varieties are reported.
The families derived from crosses of halo blight resistant selections of the Red Kidney bean with Johnson, Genesee and other resistant varieties are still segregating for resistance. Inheritance of resistance to this disease appears to be due to quantitative factors. Further tests of varietal resistance suggest that the varieties Olaf and Dunning Pea may be valuable in breeding for halo blight resistance.
The new cucumber Highmoor continues to give promising results.
The production of sweet corn hybrids for canning and domestic use continues. The new single cross Me 100 x Me 2 is early maturing, and may be suitable as a replacement of Early Topcross, a yellow canning type. Three promising late season canning hybrids have Purdue 1339A as one parent.

1345. 575:633(74.4)
Annual Report of the Massachusetts Agricultural Experiment Station for the fiscal year ending June 30, 1947 : No. 441 : Pp. 72.

Maize
Hybrid production is reported.

Tobacco
Breeding of improved strains of Havana Seed with black root rot resistance is in progress Havana 211, Havana K1, Havana K2 and Havana K2–24 appear to be the best strains so far produced.

Pepper
The promising strains being developed include a strain of the Worldbeater type and a strain resembling Merrimac Wonder. Both peppers are resistant to certain strains of tobacco mosaic.

Raspberry
The nature of winter hardiness has been investigated in six varieties.

Cranberry
Selections supplied by the United States Department of Agriculture have been planted for further testing; from these selections it is hoped to develop high yielding varieties resistant to false blossom and fungous diseases.

Onion
Male-sterile lines, obtained from the United States Department of Agriculture, were pollinated by selected Ebenezer strains for the determination of their combining ability. The resulting F_1 seed will be distributed for trial by farmers.

Asparagus
A marked tendency toward a biennial bearing habit has been observed. The capacity to transmit high yielding capacity from one generation to another is under investigation. The male asparagus plant is considered to give better yields than the female.

Broccoli
Strain 29 shows promise as an autumn type. Strains Waltham Nos 7 and 11 give good early spring yields and total yields; they require to be further selected for uniformity.

Squash
The development of a high yielding strain of Butternut squash with fewer crooked, cracked, and too long fruits is in progress.

Tomato
Breeding for resistance to leaf mould (*Cladosporium fulvum*) continues. Resistance derived from *L. pimpinellifolium* (U.S.D.A. Plant Introduction No. 112215) has been used in breeding the resistant variety Improved Bay State. Resistance from the same source has been imparted to Marglobe, but the type finally obtained does not possess firm fruit and high yielding capacity.
F_1 hybrids between Trellis varieties, all of which had either Trellis No. 22 and Waltham Forcing as one parent, gave 25% higher yields than either of these two varieties.

Sweet corn
Early maturity, good flavour and tenderness of pericarp are receiving attention in hybrid breeding. A hybrid produced by crossing Connecticut 3 with Massachusetts 2410–191 is outstanding for its early maturity. A mid-season hybrid from a cross between Connecticut 27, an inbred derived from Whipples Yellow, and Massachusetts 32, an early type of Purdue 39, gives good yields of large attractive ears. Strains of the super-sugary type are being developed.

1346. 575:633(74.9)

Science and the land.
66th Rep. N.J. St. Agric. Exp. Sta. and the 58th Rep. N.J. Agric. Exp. Sta. 1944–45 (1945) : Pp. 112.

Cereals
The wheat variety Thorne (cf. *Plant Breeding Abstracts*, Vol. X, Abst. 725) is increasing in importance in New Jersey. A disease resistant oats variety producing more straw than Victland will probably be available shortly. Wong barley has given the best performance in a three-years' test (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 534).

Plum
Promising selections of the native beach plum have been obtained among wild bushes, which give high yields of fruit with good quality; they also appear to be pest resistant.

Peach
Breeding objectives include the production of varieties with greater hardiness, a lower acid content, and earlier and later dates of maturity. Green-leaved and red-leaved hardy rootstocks have been developed. The production of nectarines with larger fruits, and improved hardiness and rot resistance is also receiving attention.

Rubus
Blackberry breeding is in progress.

Strawberry
The varieties Aberdeen, Gandy, Howard 17, Lupton, Mastodon, Pearl, Wyona and Fairfax have been used in hybridization.

Asparagus
The new strain 9418 is under commercial test.

Sweet corn
Hybrid production is reported.

1347. 575:633(74.9)

Science and the land.
67th Rep. N.J. Agric. Exp. Sta. 1945–46 : Pp. 109.

Forage legumes
Lucerne breeding for resistance to leaf hopper is being carried out. Pasture clover breeding is reported; foundation breeding stock has been selected from hybrid combinations and is now being inbred to develop strains for seed production purposes.

Tomato
Selections from the crosses Valiant x Rutgers and Pritchard x J.T.D. show promise as early maturing market tomatoes.

Capsicum
A non-commercial pepper strain has been used in breeding for resistance to the yellow pod disease, caused by tobacco mosaic virus. The resistant strain has been so much improved that some selections produce fruit weighing half a pound; improvement in fruit shape, however, is required. The strain is susceptible to etch and ring spot virus.

Sweet Corn
The hybrid P39 x N.J. 143y is particularly promising. Some success is reported in breeding for resistance to cold and drought.

Peach
Four new varieties were named Early East, Jerseyland, Red Crest, and Laterose. The two first named varieties are yellow-fleshed early maturing peaches, ripening before Golden

Jubilee. Red Crest is a yellow-fleshed variety ripening just before Elberta. Laterose, a white-fleshed peach, ripens after Elberta. Varietal resistance of the fruit buds to cold has been studied; under New Jersey conditions Elberta is moderately hardy, Rosebud and Cumberland are very hardy, and Golden Jubilee and Eclipse slightly hardier than Elberta. Cold resistance may vary considerably from the dormant bud stage in winter to the pink bud or bloom stage in early spring; a variety may be much more resistant in the dormant bud stage than in spring, and vice versa.

Apple

Breeding work is in progress; selected seedlings are to be commercially tested.

Cranberry

In a test of over 450 hybrids, made in co-operation with the United States Department of Agriculture, several varieties showed greater resistance to false blossom than Early Black and McFarlin; these varieties are to be tested under commercial conditions.

1348. 575:633(75.5)

Through research to better farming.
Bien. Rep. W.Va Agric. Exp. Sta. 1944–1946 (1947) : Bull. No. 330 : Pp. 49.

Maize

Hybrid production is in progress. The recently developed hybrids West Virginia B–25 and B–29 are particularly promising.

Kentucky blue-grass

Stripe smut resistant selections are under test.

Potato

Material obtained from the United States Department of Agriculture and other sources is being selected.

1349. 575:633(75.5)

Minutes of the 25th Annual Meeting and Proceedings for the Year 1946–1947 of the Virginia Academy of Science.
Pp. 144.

The report gives abstracts of papers included in a symposium on "The place and importance of plant breeding in Virginia Agriculture" held at the 1947 annual meeting at the Virginia Academy of Science.

Henderson, R. G. *Breeding tobacco for disease resistance.* (*p. 55*).

Breeding investigations at the Virginia Agricultural Experiment Station have resulted in the production of black root rot resistant tobacco varieties and blackshank resistant lines. Selection from crosses between mosaic resistant lines and commercial tobaccos show promising leaf quality and resistance to black root rot as well as to mosaic. These lines are under test for their yielding capacity.

Smith, T. J. *Alfalfa breeding technique.* (*pp. 55–56*).

Forage and seed yield, quality of forage, longevity, and resistance to diseases and insects are receiving attention. In the breeding technique used, clones are tested for forage and seed yields in open-pollinated nurseries, after which seed from individual clones is planted and the progeny tested for various characters. The original clones of the best polycrosses are mixed to form a new synthetic variety. The original clones are also being tested in various hybrid combinations with a view to the production of F_1 hybrids.

Shulkcum, E. *Oat breeding technique.* (*p. 56*).

Oat breeding for combined resistance to *Helminthosporium* blight, rust and smut is in progress. Clinton, Benton, Mohawk and Mindo have been used as sources of resistance to the first-named disease.

Dunton, H. L. *Needed research in field crop breeding.* (*p. 56*).

Attention is drawn to the general need of breeding for resistance to *Sclerotinia Trifoliorum* in leguminous field crops, and for disease resistance and other characters in several additional field crops.

Parker, M. M. — *Objectives of the vegetable breeding program at the Virginia Truck Experiment Station.* (*pp. 56–57*).

Cantaloupe breeding aims at the production of an orange-fleshed variety with high quality, suitable for both local and distant markets.
In collard breeding, improved winter hardiness, increase of the leaf area in proportion to the midrib, and fixation of the type and colour of the variety Vates are the objects of the present programme.
The production of a winter hardy, dark green, finely curled kale is being carried out.
Potato breeding aims at the development of an early variety and a late variety, both better adapted to Virginian conditions than present varieties.
Sweet potato breeding has as its objective the development of a high yielding variety, preferably of the Porto Rico type, suitable for the fresh market and storage.
Onion breeding is directed towards the production of a non-bolting winter hardy type, the seed of which can be planted in late summer.
Improvement of the spinach variety Domino is in progress.

Cook, H. T. — *Breeding plants for disease resistance at the Virginia Truck Experiment Station.* (*p. 57*).

The blight resistant spinach varieties Virginia Savoy and Old Dominion are mentioned as past achievements in breeding for disease resistance. A wilt resistant strain of Virginia Savoy has now been selected.
Investigations in progress include breeding for resistance to stem rot in sweet potato, downy and powdery mildews in cucumber and cantaloupe, wilt in kale, and blue mould in spinach.

Moore, R. C. — *Progress in grape and raspberry breeding at V.P.I.* (*p. 57*).

Grape breeding is designed to produce new varieties combining the yielding capacity, suitability for transport, and pulp and fruit characteristics of *Vitis vinifera* with the winter hardiness and disease resistance of native species. The crosses Salem x Emperor, Salem x Molinera, Salem x Ribier and Herbert x Ribier have produced promising selections. The pulp characteristics of *V. vinifera* have segregated independently of reaction to winter injury and diseases. Several factors appear to be involved in the inheritance of the characters of *V. vinifera* pulp.
Raspberry hybrid and selfed seedlings are under investigation.

Flory, W. S. (jun.) — *Objectives, progress and techniques in breeding new fruits for Virginia.* (*pp. 57–58*).

Apple breeding objectives include late blooming combined with good dessert and storage quality, satisfactory colour and pest resistance.
Yellow and white fleshed nectarines, with large size, firm flesh, good quality, and resistance to brown rot and possibly other diseases are being developed.
It is hoped to produce peaches maturing the same time as Elberta or earlier, with improved quality, size and winter hardiness.
Grape breeding is in progress (cf. abstract above). Breeding for disease resistance in brambles and improved blueberry varieties is also being carried out.
The techniques of the following are under investigation: pollen collection; pollen analysis, including longevity studies; emasculation and pollination; seed stratification and germination methods; the use of marker characters, particularly in peach hybrid seedlings; and the cytological analysis of apple and peach seedlings.

Andrews, F. S. — *Needed research in vegetable breeding in Virginia.* (*p. 58*).

Objectives in breeding work on potato, tomato, broccoli, peas, beans and several other vegetables are defined.

Minutes of the Section of Biology. (*p. 72–80*).

The minutes of the Section of Biology include abstracts of the following papers:—

Baldwin, J. T. (jun.) *Hybrid oak. Quercus virginiana x Q. lyrata.* (*p. 74*).

A semi-evergreen hybrid oak believed to be a natural hybrid between *Q. virginiana* and *Q. lyrata* is reported. Seedlings obtained from the hybrids are under investigation. Their chromosome number is $2n = 24$.

White, O. E. *Fasciation: its distribution and causes.* (*pp. 74–75*).

General consideration is given to the distribution and causes of fasciation in plants.

Young, M. M. *Chromosome numbers in the genus* Physalis (*Solanaceae*). (*p. 78*).

Chromosome numbers of $2n = 24$ were found in *Ph. philadelphica* Lam.; *Ph. barbadensis* Jacq.; *Ph. barbadensis* var. *obscura* (Michx) Rydb.; *Ph. heterophylla* Nees; *Ph. ixocarpa* Brot.; *Ph. lanceifolia* Nees; *Ph. mollis* Nutt.; *Ph. pruinosa* L.; *Ph. virginiana* Mill.; *Ph. pubescens* L.; and in 33 other collections representing at least seven additional species at present unidentified. The chromosome number of *Ph. peruviana* L. was found to be $2n = 48$. The genus *Physalis* therefore appears to be stable throughout its American range as regards chromosome number, with the exception of the tetraploids *Ph. peruviana* and *Ph. angulata.*

1350. 575:633(75.8)

59th Annual Report of the Georgia Experiment Station of the University System of Georgia July 1, 1946 to June 30, 1947 : Pp. 144.

Wheat

The development of a high yielding disease resistant variety is in progress. So far the variety Sanford appears to be the best adapted wheat in Georgia. The new rust resistant wheat H 1050–12–5–10–3 has been named Chancellor and is to be distributed; it has good winter hardiness and straw quality, and in yield and milling quality equals Sanford.

Oats

The production of improved varieties for all parts of Georgia is receiving attention. Varietal and hybrid selections are being tested for resistance to seedling blight (*Helminthosporium Victoriae*), crown rust and other diseases.

Rye

Breeding work has been begun to isolate superior lines which will be used to produce synthetic varieties.

Maize

Hybrid production is reported.

Barley

Many promising hybrids are under selection.

Sorghum

Grain varieties are being tested.

Forage legumes

A new selection of the Korean type of annual lespedeza produced by the United States Department of Agriculture has been named Climax. It has outyielded Korean and Kobe, matures later than Korean and produces more hay and seed. It is also less susceptible to shattering than Kobe.

Species of *Crotolaria* were tested for green manure and seed yields.

Sweet potato

The release of seedling B–196 under the name Whitestar is under consideration. It has outyielded Triumph in Georgia and other states. It is a starch-feed type, resistant to stem rot.

Variety 129655 is promising as a sweet potato for processing. Its yield, however, is not as high as that of some other varieties; it is hoped to improve this character by breeding. Information is given on the suitability for canning and freezing of 23 varieties and selections.

Cotton
Wilt resistant strains of Empire are under test. Hybrids between Empire and Stoneville 20 from Tennessee are being back-crossed to wilt resistant strains of Empire with a view to transferring the blackarm resistance of Stoneville 20 to Empire. The Hopi-Acala strain from California, which has exceptionally high tensile strength, has been crossed and back-crossed with wilt resistant srtrains of Empire to improve the fibre strength of the latter variety.

Fig
The varieties Hunt and Celeste have shown less winter injury than Brown Turkey and Green Ischia.

Peanut
Tests of hybrid strains and strains selected from standard varieties are reported.
Varietal differences in susceptibility to concealed damage, due to infection with a species of *Diplodia*, *Sclerotium bataticola* and other saprophytic fungi, have been noted; Dixie Runner has shown less damage than the standard variety North Carolina.

Grapes
Considerable variation in the disease susceptibility of muscadine grapes suggests the possibility of producing resistant varieties.
Hybrid seedlings obtained from controlled crosses of muscadine grapes are being selected to obtain self-fertile varieties in quality equal to or better than the best pistillate varieties, such as Hunt and Scuppernong.

Cantaloupe
Salmon-fleshed and green-fleshed strains have been developed from a cross between downy and powdery mildew resistant S 213 and the aphid resistant variety Smith Perfect; the green-fleshed strain C 56–25–21–1–1–45 is vigorous and apparently more discease resistant than any of the other strains.

Water-melon
Two promising *Fusarium* wilt resistant strains have been obtained from the cross Georgia No. 2 x Ice Box. They produce small round melons weighing 10–12 lbs, suitable for putting in a domestic refrigerator.
The F_2 of the cross between Georgia No. 2, a variety with high quality, and Hawkesbury, a tough rinded variety, is under field observation. Both parents are resistant to *Fusarium* wilt.

Tomato
Hybrid strains from the cross *Lycopersicon pimpinellifolium* x *L. esculentum* twice back-crossed to *L. esculentum* showed resistance to *Fusarium* wilt and root-knot nematode, but were less resistant to *Septoria*.

Soya bean
Breeding to develop an improved forage type and also a better oil bean is being continued. Further selection is being carried out on Gatan and other forage varieties.
No variety has been found highly resistant to southern blight (*Sclerotium Rolfsii*). Varieties relatively resistant to bacterial pustule and southern blight, *Cercospora sojina*, and to wildfire are noted.

1351. 575:633(76.4)

59th Annual Report of the Texas Agricultural Experiment Station 1946 : Pp. 104

Wheat
Among the commercial varieties grown in Texas, only Austin has shown loose smut resistance; this variety is also rust resistant. Breeding is in progress to incorporate the resistance of Austin and other varieties to these two diseases in new adapted wheats.

Maize
Samples of Guatemalan maize have been collected and are to be used in the breeding programme, with a view to obtaining improved inbred lines.

Sorghum
White and yellow strains of Double Dwarf Sooner milo have been developed from a cross between Early White milo and Double Dwarf Yellow milo (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1656).
High yielding selections resistant to foliage diseases have been obtained at the Weslaco Substation from crosses between Shallu and standard varieties.

Rice
Texas Patna and Bluebonnet, released in 1942 and 1944 respectively, are now widely grown varieties suitable for combine harvesting. Texas Patna resulted from a cross between Rexoro and C.I. 5094, and Bluebonnet from a cross between Rexoro and Fortuna. Both varieties have long slender grain of good milling and cooking qualities. Texas Patna matures in 150 to 170 days, Bluebonnet in 120 to 135 days. Further breeding is in progress to produce similar types for combine harvesting, with shorter and stiffer straw, and improved resistance to leaf spot diseases; promising selections have been obtained from a cross between Rexoro and Nira.

Forage grasses
Selection is being carried out on yellow beard grass (*Andropogon ischaemum*) to produce a leafy type with high forage yields.
Selection of Rhodes grass is reported.

Cotton
The study of trisomic plants is in progress to determine the linkage relationships of red leaf colour, okra leaf shape, brown lint, smooth seed and several other characters.
A natural amphidiploid ($2n = 26$) has been secured by crossing *Gossypium anomalum* and *G. Davidsonii*. This amphidiploid and other natural and artificial amphidiploids are being used in crosses with Upland cotton.
A high yielding, early maturing cotton selected from a cross between Macha and Acala is to be increased. Its staple length is $\frac{7}{8}$ in. On account of its fairly determinate fruiting habit the variety will be fully mature and ready for mechanical stripping before plant deterioration sets in as a result of frost. The new hybrid strains C.A. 89 A, A.A. 122 and Stormproof No. 1 are also suitable for mechanical harvesting.
Tests of commercial and experimental cottons have been conducted during the past five years. Deltapine 14, Stoneville 2 B, Rogers Acala 111, and selections of the Rowden and Coker types have shown high yields, good fibre properties and high spinning performance.

Safflower
The possibilities of producing this crop in Texas are considered.

Peach
Varieties of the Honey type have been crossed with several commercial varieties, in the attempt to develop peaches adapted to the mild winter of southern Texas; selections have been back-crossed to suitable commercial varieties.
Promising F_1 selections of Florida Gem x Early Elberta have been crossed with Eclipse and Stark's Early Elberta; both the latter are early maturing commercial peaches of the freestone type. A yellow-fleshed freestone selection from the cross with Stark's Early Elberta has been crossed with Burbank Early July Elberta.
The cross (Florida Gem x Early Elberta) x Halehaven has given a yellow freestone selection ripening before the middle of June. A cross between Halehaven and Luttichau has produced promising yellow-fleshed seedlings. The variety Pallas has also been used in hybridization. The new yellow-fleshed freestone variety known as Holt shows promise as a peach for autumn marketing, ripening in the second week of September. The flesh is firm, yellow streaked with red, and sub-acid; the stone is described as exceptionally small. The variety originated as a chance seedling at Montague.

Onion
Improved varieties for southern Texas have been produced.

Broccoli
Texas Early Green Sprouting broccoli is a new variety with superior quality and yielding capacity under Texan conditions, developed from a single plant selection, and by subsequent inbreeding and mass selection. It produces large, firm early heads.

Cantaloupe
A downy mildew resistant variety, designated K–15 has been developed at the Weslaco station. It has been bred by crossing the wild downy mildew resistant "smell" melon with Hale's Best, and crossing the resulting F_1 hybrid with Smith's Perfect. The new variety has sweet, bright orange flesh, good form and complete netting. Its capacity to set fruit requires improvement. Foundation seed stocks are to be developed in 1947.

Tomato
The variety Porter has been crossed with Stokesdale with a view to increasing the size of the former variety, while retaining its desirable qualities; a promising selection has been secured and is to be distributed for further trial.
The varieties Red Cloud (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1599) and Bounty, developed in Nebraska, yield well under the hot dry conditions often prevailing in north-west Texas.

1352. 575:633(78.8)
60th Annual Report of the Colorado Agricultural Experiment Station 1946–1947: Pp. 39.

Potato
The scab resistant variety No. 6317 is ready for increase, naming and release to foundation growers; the variety is also resistant to several virus diseases. A quick method of identifying specific virus diseases has been devised in which use is made of the fluorescence pattern under ultra-violet light.

Onion
Progress in the development of F_1 hybrid onions by utilization of the male-sterile character is briefly reported.

1353. 575:633(79.6)
Agricultural research in Idaho.
54th Rep. Idaho Agric. Exp. Sta. 1947 : Bull No. 269 : Pp. 50.

Potato
Resistance to *Verticillium albo-atrum* is receiving attention.

Onion
Work on the improvement of Sweet Spanish onions is being carried out. It includes the production of inbred lines for use in F_1 hybrids.
The question whether in selection high soluble solids content can be correlated with keeping quality in storage and with higher yields of dehydrated product is being studied.

Tomato
Intervarietal and interspecific hybrid selections are under test for curly top resistance.

Phaseolus
The development of bean varieties resistant to the two mosaic diseases now occurring and to curly top is in progress; Great Northern strains have been used as a source of curly top resistance.

1354. Burnett, F. 575:633(91)
Report on agriculture in Malaya for the year 1946 (1947) : Pp. 85.
Details of the recovery of research work after the war are reported. The following items are of particular interest:—

Oil Palm
Individual tree recording has been begun on high-yielding selfed and hybrid palms and on trees yielding oil with high carotene content.

Derris elliptica
Selected clones of the varieties Sarawak Creeping and Changi No. 3 have been re-established for multiplication.

Ipecacuanha

Clonal selection for emetine and total alkaloid content has been begun.

1355. 575:633(91)

TOXOPEUS, H. J. 576.356.5:581.04:633(91)

Botanisch onderzoek ten behoeve van de plantenveredeling. (**Botanical research in the interest of plant breeding**).

Landbouwk. Tijdschr. Wageningen 1947 : **59** : 328–36.

The author took as his text the theme developed by him in a lecture to the Association of Experiment Station Workers (V.V.P.P.) at Buitenzorg, Java, in 1937, that nothing be left undone that can be done to increase the variability of the material for selection, picking up the thread by describing discoveries, since 1937, that bear on the subject and giving examples of work done at the Botanical Institute on studying the range of forms, and on the importance of studying the variability of wild populations. Such work has been done on *Aleurites, Ceiba pentandra, Cymbogon Nardus, Derris, Eugenia aromatica, Amorphophallus* and *Hibiscus.*

The most important recent development has been the use of colchicine to double the chromosome number. This has been done for most cultivated crops of temperate regions. The resulting material in itself was never an improvement due to disturbed equilibrium of genes and development, but is to be considered as a new starting point for breeding. As fertility is seriously affected the method should be most useful for plants that can in practice be vegetatively reproduced and of which the product is vegetative. Moreover, self-pollinated crops are more seriously affected than cross-pollinated, and those with a low chromosome number are more suitable than those with many chromosomes. The most promising tropical crops for such treatment are therefore: *Hevea brasiliensis, Cinchona Ledgeriana, Boehmeria nivea,* and *Manihot utilissima.*

Doubling of chromosomes is also useful for sterile species hybrids. Sometimes species crosses can only be made after such treatment. In breeding for *Phytophthora* resistance in potatoes in Java, the easily obtained F_1 from *Solanum Antipoviczii* ($2n = 48$) x *S. chacoense* ($2n = 24$) was completely sterile; but by germinating the seed in very weak colchicine solution, 25 plants out of 100 were obtained that set seed freely and which could be crossed easily with *S. tuberosum.*

Another development that, combined with doubling the chromosome number, increases the possibilities of species crossing, is the development of very small immature embryos, using the growth factor in coconut milk. The author applied this method to hybrids of *Hibiscus cannabinus* x *H. Sabdariffa.*

The use of X–rays to overcome self sterility should be tried with *Cymbopogon Nardus, Amorphophyllus oncophyllus,* and clones of potato and derris. It is probably not useful for *Theobroma Cacao* and *Cinchona* as the production of a few seeds is insufficient to ensure development of a fruit.

Derris

Following an account of the difficulties to be encountered in breeding *Derris,* a collection of 1200 plants growing wild or in villages was described. The wild were extremely variable in form and very low in rotenone content, flowered and fruited freely, and in some cases gave offspring that appeared to be very homogeneous. Selection of clonal material from the villages offers greater prospects than working on wild forms, because of their low toxin content.

The valuable clones of *D. elliptica* show a high degree of pollen sterility, while those of *D. malaccensis,* although sufficiently pollen fertile, appear to be extremely heterozygous and give a high percentage of dwarf offspring. In both species, whether wild or cultivated, the somatic chromosome number is $2n = 22$ or 24. Strongly developed hybrids have been obtained between cultivated *D. malaccensis* ($2n = 22$) and cultivated *D. elliptica* ($2n = 22$), with in general a lower rotenone content than their parents, and between wild *D. elliptica* ($2n = 24$) and cultivated *D. malaccensis* ($2n = 22$), with practically no rotenone but generally good growth. Hybrid pollen is more or less sterile and seed setting is slight. All sorts of irregularities occur in development of pollen and egg cells. Breeding on a wider basis than heretofore offers good prospects.

Cloves
There is a great paucity, even in the big producing areas of Benkoelen and Padang and in Ambon, which is supposed to be its original home. Wild material collected in Ambon, West Ceram and in Saparoa, differs greatly from the cultivated, being more vigorous with much larger leaves and flowers, but containing no, or at most much less, eugenol. It is also more variable. In all probability on some of the islands, wild types, more like the cultivated and from which the latter may have evolved, will be found. Hybridization of wild and cultivated types is possible. Wild types, with their greater vigour, may prove to be very desirable as stocks for cultivated scions, particularly to help new varieties over their disease susceptible adolescence. C.B.

1356. 575:633(94.3)
Annual Report of the Department of Agriculture and Stock, Queensland for the year 1946–47 (1947) : Pp. 109.

Wheat
New hybrid selections have shown promise as regards stem rust resistance and ability to yield grain of good quality under droughty conditions.

Oats
Breeding for rust resistance is reported.

Sorghum
Strain 11S, selected from Wheatland, and a selection of Early Kalo gave good results in a varietal trial at the Biloela Station. Strains of the Kalo type have been tested. Many selections from Shallu crosses possess the desired open panicle and are to be tested in the coastal areas. The inheritance of characters of the grain and panicle, height and colour of the midrib was studied in the crosses Ajax x Coastland, Hegari x Coastland, Hegari x Ajax; in addition, data were obtained from the F_2 of natural crosses on the inheritance of awns and grain colour. Selection work on grain and sweet sorghum varieties was continued in the Kingaroy district.

Cotton
Progenies of the Miller strain MIB–43–9–0 are under test in the Callide Valley. New crosses and back-crosses of the jassid susceptible varieties, Triumph, Lone Star, Mexico Acala, Miller and Umil 12 with resistant Rhodesian and Trinidad cottons are being studied. Among less recently obtained material, Ferguson has proved valuable in breeding for jassid resistance. (Miller x U4) x Miller progenies show promise in several characters. The jassid resistant Miller strains III–165–2–1–0–0–0 and III–165–3–1–0–0–0 are to be tested on a full scale. The strains have longer fibre than the present commercial Miller Lot 1. Miller and other strains were tested at the Biloela Station.

Papaw
Breeding work at Nambour continued.

1357. Fedoseyev, I. [Fedoseev, I.] 575:633:007(47)
Education in the U.S.S.R.
Soviet News 1948 : No. 1892 : p. 4.
The death is reported of Professor Lisitsyn [Lisicyn] of the Timirjazev Agricultural Academy. It is mentioned that his rye and oat varieties are now widely grown in the U.S.S.R., and that he received the Orders of Lenin and of the Red Banner of Labour.

1358. Åkerberg, E. 575:633:061.6(48.5)
Ultunafilialen, dess arbetsresultat och kommande arbetsuppgifter.
(The Ultuna Branch Station, results of its work and its future tasks).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 522–27.
In this address, the speaker covered the history and work of the Station since its foundation in 1897 as the first branch station of the Swedish Seed Association, up to the present day. Ultuna was specially favoured for work on the old Swedish land wheats of Central Sweden, but its scope has now extended to many other crops and a wider study of plant breeding problems, among which the local requirements of the region served by the station may assume an increasing importance (cf. Absts 1516, 1557, 1652, 1931, 1958).

1359. 575:633:061.6(48.5)
633.00.14(48.5)
ÅKERMAN, Å. 633.00.15(48.5)
Inför Ultunafilialens 50-årsjubileum. (**Celebration of the Ultuna Branch Station after 50 years**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 141–43.

This is a note on the establishment and subsequent development of the Ultuna Branch Station of the Swedish Seed Association. The sub-station at Hjälmarsberg, formerly for the Örebro district, and the need for another to serve the Stockholm area are mentioned. Some of the crops studied at the Ultuna Station and new varieties produced are referred to

1360. ANDERSSON, G. 575:633:061.6(48.5)
Sveriges Utsädesförenings årsmöte i Uppsala, tillika Ultunafilialens 50-årsjubileum den 11–12 juli 1947. (**The meeting of the Swedish Seed Association in Uppsala and also the celebration of the 50th anniversary of the Ultuna Branch Station, 11-12 July, 1947**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 501–14.

A detailed account, with illustrations, is given of the lectures, tours, entertainments and demonstrations, which those who attended this celebration of the foundation and work of the Institute enjoyed. Historical aspects were not neglected.

1361. 575:633:061.6(48.5)
633.2:575(48.5)
ELOFSON, A. 633.2–1.531.12(48.5)
Sveriges Utsädesförenings Ultunafilial. Kort historik jämte några personliga håghomster. (**Ultuna Branch Station of the Swedish Seed Association. Short history and some personal reminiscences**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 144–51.

A detailed, historical outline is given of the beginnings and subsequent aims of the work of the Ultuna Branch Station and its directors from 1897–1944. Fodder crops and production of seed of herbage plants have been two of the main subjects of study.

*GENETICS 575.1

1362 DIONIGI, A. 575.1
La pianta su misura. (**The plant is measured**).
Ital. Agric. 1948 : **85** : 117–24.

The author, having studied many hundreds of crosses both intraspecific and interspecific, asserts that the Mendelian laws are no more than generalizations, incapable of predicting the results; moreover, the possibilities of improvement by the classical plant breeding methods are very quickly exhausted. Even comparatively new methods, such as the use of mutations, are shown to depend entirely on chance for their success, and the new genetics of the Soviet Union is dismissed as irrational. The former system puts the emphasis on the organism, the latter on the environment. The author has attempted to evolve a system in which the two are synthesized into a bio-ambiental equilibrium. Characters themselves do not exist, they are only cognizable by virtue of an objective difference revealed by the presence of some contrasting object. Since the number of these is infinite, it follows that the number of characters is also infinite. In consequence the gene, in the sense of a particle corresponding to one or to a limited number of characters, ceases to have any meaning and becomes a purely relative concept, to be conserved only for purposes of convenience. According to the new concept, most agriculturally desirable characters can be attained by suitable adjustments of the developmental rhythm of the plant, a reduced rate of development inducing resistance to winter frosts, accelerated development in certain phases inducing resistance to rusts and drought and also high yield. Though the means are not defined, it is affirmed that efficient means are now available for achieving the necessary adjustments quickly, rather than by the long and laborious process of factorial analysis.

* General studies, see also individual crops.

1363. 575.1(47)
"The truth" about genetics. *Pravda* discusses "antipatriotic acts under the guise of 'scientific' criticism".
J. Hered. 1948 : **39** : 18–21.
A translation in English is presented of the article by Laptev already reviewed in *Plant Breeding Abstracts* (cf. Abst. 48).

1364. Chattopadhyay, K. P., Lewis, J. and Gates, R. R. 575.1(47)
Vavilov and the Soviets.
Sci. and Cult. 1947 : **13** : 189–93.
This article consists of separate notes by the three authors indicated above.
Those by Chattopadhyay and Lewis are protests against the statements made in a previous article by Gates (cf. Abst. 666) about the attitude of the Soviet State to scientific research. Lewis points out that Lysenko's genetical theories have been criticized within the Soviet Union by Serebrovskii, Žebrak, Karpečenko, Dubinin, Prokofjeva, Ignatjev, Navašin and Šapiro, all of whom express ordinary genetical views and that there has been no attempt to suppress this criticism. He also states that Žebrak, "an orthodox Mendelian who has consistently and vehemently opposed Lysenko, and with complete impunity" has been appointed president of the White Russian Academy of Sciences and head of the Department of Genetics at the Moscow Agricultural Academy. *Moscow News* is quoted as saying of Žebrak that "his field is so-called classical genetical, one of the two trends in genetics being developed in the U.S.S.R." Lewis concludes that "there is obviously no persecution of orthodox genetics in the Soviet Union".
In the third note, Gates replies to the charges of Chattopadhyay and Lewis, and reiterates the truth of his original statements.

1365. Hawkings, J. R., Darlington, C. D., Greenwood, Bachtin, C., Garry, T. G. and Bourne, H. 575.1(47)
Genetics and science in the U.S.S.R.
Brit. Med. J. 1947 : 886–88.
A series of letters is presented commenting on an earlier article in the *British Medical Journal* on Soviet genetics (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 43). In the opinion of Hawkings and Bachtin this article is biassed and overlooks the fact that such geneticists as Žebrak still hold honoured positions in Russia. Darlington, on the other hand, points out that Žebrak and also Dubinin have recently been strongly criticized in *Pravda* for servility to bourgeois science (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 48). Garry and Bourne associate themselves with the criticisms of the original article.

1366. Blakeslee, A. F. 575.1:007
Edmund Ware Sinnott.
Sci. Mon., N.Y. 1948 : **66** : 5–8.
Sinnott's genetical work is referred to in this biographical note.

1367. Sarkar, S. S. 575.1:007
Thomas Hunt Morgan (1866–1945).
Sci. and Cult. 1946 : **11** : 407–08.
A brief account is presented of some of the genetical work of Morgan and his contemporaries.

1368. 575.1:007(47)
575.1:007(43.7)
Soviet scientists honoured by new democracies.
Soviet News 1948 : No. 1925 : p. 4.
T. D. Lysenko and N. V. Cicin [Tsytsin] have been elected members of the Czechoslovak Agricultural Academy.

1369 Åkerman, Å. 575.1:007(48.5)
H. Nilsson-Ehle 75 år. (**H. Nilsson-Ehle's 75th birthday**).
Lantmannen 1948 : **32** : 95–96.
This is an appreciation of Nilsson-Ehle's great contributions to research on inheritance and genetics.

1370. 575.1:576.34
Westergaard, M. 576.31:581.192
Et nyt Arbejdsomraade for Arvelighedsforskningen: Den biokemiske Genetik. (**A new sphere for genetic research: biochemical genetics**).
Nat. Verd. 1946 : **30** : 253–60.
A lucid analysis is given of the work that has been done on the nature of the gene and its possible mode of action, as studied from the biochemical standpoint.
Biochemical genetics might well be called genetical biochemistry to which it has contributed much in connexion with the purely biochemical study of the intermediate metabolism of organisms.

1371. Villee, C. A. 575.1:577.15
Studies in biochemical genetics in *Drosophila*.
J. Gen. Physiol. 1948 : **31** : 337–45.
Experiments carried out on the oxygen consumption of the imaginal discs of the wild, vestigial wing, miniature wing and four-jointed types of *D. melanogaster* suggest that the enzymatic effects of the genes determining the different types of adult fly are specific and localized in certain tissues of the larva.

1372. Jones, M. D. 575.1:578.08
The fraction method of analysis of factors.
J. Hered. 1947 : **38** : 368–70.
A method using fractions for the genetic analysis of independent assortment and interaction of factors is described. As a basic system it is broadly applicable to the analysis of both complex and simple hybrid ratios in cases of complete or incomplete dominance, epistasis, inhibition, and other types of factorial interaction which may alter normal Mendelian ratios. Essentially the method is similar to the chess-board, branching, and algebraic methods, but it is considered to be a more rapid and simple means of presentation and thus more suitable in teaching genetics.

1373. Bhat, N. R. 575.116.4:575.116.1
An improved genetical map of Punnett's "B" chromosome in the sweet pea, *Lathyrus odoratus* L.
J. Genet. 1948 : **48** : 343–58.
The methods employed by Bateson and Punnett and by Bridges in mapping the B chromosome of *L. odoratus* are briefly reviewed and are compared with Fisher's scoring system which is then used by the author for estimating the recombination percentages, scores, information and map lengths for the three segments B_1, B_2, B_1 B_3 and B_2 B_3 on the basis of Punnett's data recorded from 1904 to 1928 on the characters dark *v.* light axil, fertile *v.* sterile anthers and normal *v.* cretin flowers. The results are discussed and are compared with those of the other authors mentioned.

1374 Diotallevi, Z. 575.12
Impollinazione naturale ed artificiale. (**Natural and artificial pollination**).
Ital. Agric. 1947 : **84** : p. 216.
It is suggested that the results of natural hybridization, especially among self-sterile fruits, will be better than those hitherto obtained from artificial hybridization.

1375 Meunissier, A. 575.12:578.08
La technique de l'hybridation. (**The technique of hybridization**).
Rev. Hort. Paris 1946 : **30** : 109–10.
Methods of emasculation, bagging, conservation of pollen and artificial pollination are described with reference to wheat, barley, sugar beet, sugar cane, vines and other plants.

1376. HAGBERG, A. 575.125
Hybrid vigour in *Galeopsis*.
Hereditas, Lund 1948 : **34** : 366–68. (Abst.)
A positive correlation was found between the degree of sterility and hybrid vigour, based on dry weight, in F_1 generations of interspecific and intraspecific crosses of *G. Tetrahit* and *G. bifida*. The correlation is evident when plant height is taken as the criterion. These results cannot be explained by delayed maturation or by continued vegetative growth due to sterility, for the differences in plant height between parents and F_1 hybrids were often greatest in the period before maturation.

1377. BLAKESLEE, A. F. and SATINA, S. 575.127.2:578.08
Further study of crossability in *Datura*.
Amer. J. Bot. 1947 : **34** : p. 580. (Abst.)
By dissecting out arrested hybrid embryos and growing them in culture new interspecific hybrids have been obtained in the genus *Datura*.

1378. MICHAELIS, P. 575.182
Über das genetische System der Zelle. (**The genetical system of the cell**).
Naturwissenschaften 1947 : **34** : 18–22.
Arguing from his work on reciprocal hybrids of *Epilobium*, the author expounds the view that the nuclear genes and the hereditary components of the cytoplasm form a complex system whose mode of action depends not only on the components of the two subsidiary systems, but also on the manner in which these are linked. The cytoplasm in units of inheritance may be recedent to the nuclear genes, in which case they do not achieve phenotypic expression, or antecedent, in which case, whatever the nuclear genes involved, a specific developmental tendency [Entwicklungstendenz] results. The extent, however, to which the developmental tendency is realized is affected by the nuclear genes; conversely, the expression of the latter may be variously curtailed by the developmental tendency of the cytoplasm. The significance of these findings for the interpretation of heterosis, lethality and evolutionary problems is discussed.

VARIATIONS, MODIFICATIONS, MUTATIONS 575.2

1379. HALDANE, J. B. S. 575.22
The theory of a cline.
J. Genet. 1948 : **48** : 277–84.
An estimate is made of the relationship between the slope of a cline across a boundary between two areas differing in their selective effect on an animal population, the intensity of selection, and the mean distance migrated per generation.

1380. VOGT, O. 575.22
Ethnos, ein neuer Begriff der Populations-Taxonomie. (**Ethnos, a new concept in population taxonomy**).
Naturwissenschaften 1947 : **34** : 45–52.
From a study of the variability shown by insect populations, the author introduces the concept, ethnos, a population occupying a determinate area and composed of a number of biotypes differing slightly from one another. The nature of the variability shown by an ethnos is considered, also its evolutionary and genetic status.

1381 DAVIDSON, J. F. 575.22:51
The polygonal graph for simultaneous portrayal of several variables in population analysis.
Madroño 1947 : **9** : 105–10.
The technique of constructing polygonal graphs for the analysis of plant populations in which a number of characters are being considered is described. The graph consists of a circle with as many radii drawn in as there are characters being considered. Each radius is scaled for recording the character which it represents. The data relating to any one plant can then be represented by joining the appropriate points on adjacent radii

thereby constructing a polygon, and similarly for each other plant. Should any character be distributed bimodally, this will show clearly in the series of superimposed polygons.

1382. KENDALL, D. G. 575.22:519.24
On the generalised "birth-and-death" process.
Ann. Math. Statist. 1948 : **19** : 1–15.

Solutions are presented for the equations governing population size when the birth and death rates, $\lambda(t)$ and $\mu(t)$ are functions of time t. Formulae are derived for the probability of the extinction of the population; in particular it is shown that the necessary and sufficient condition for the ultimate extinction of the population is that the integral

$$I = \int_0^\infty e^{\rho(\tau)}\, \mu(\tau) d\tau$$

should be divergent. It follows that there is only a zero probability of extinction when μ is zero, that is, when reproduction only is occurring.
The general theory is applied to examples in which λ (t) is a constant and μ (t) a constant multiple of t, and in which λ (t) and μ (t) are periodic functions of t.

1383. SLIZYNSKA, H. and
SLIZYNSKI, B. M. 575.243:581.04:576.356
Genetical and cytological studies of lethals induced by chemical treatment in *Drosophila melanogaster*.
Proc. Roy. Soc. Edin. 1947 : **62** : 234–42.

A cytological study is reported of chemically induced sex-linked recessive lethals in *D. melanogaster*. In about one-fifth of them deficiencies were detected in the salivary gland chromosomes, a proportion very similar to that for spontaneous lethals, X–ray induced lethals and ultra-violet induced lethals.

1384. 575.247:575.7
CHOUARD, P. 575.25
L'"individu végétal" et l'"hérédité végétative". (**The "plant individual" and "vegetative heredity"**).
Rev. Hort. Paris 1946 : **30** : 125–26.

It is pointed out that the degeneration of clones may be due to either virus diseases or to bud mutations. The latter are usually disadvantageous, and parts of plants which are less vigorous than the rest should not be used for propagation. Graft hybrids and chimaeras resulting from genetical mutations are distinguished from plants in which the various parts exhibit different characteristics as the result of differences in nutrition, hormones, auxins or the supply of light.

1385. BUTTERS, F. K. and
TRYON, R. M. (jun.) 575.247:576.356.5
A fertile mutant of a *Woodsia* hybrid.
Amer. J. Bot. 1948 : **35** : 132–33.

A somatic mutation causing the apical portion of a frond of an otherwise sterile *W. Abbeae* hybrid to become fertile is attributed to spontaneous chromosome doubling in the apical cell during the early development of the frond so that the cells subsequently cut off from the apex were allopolyploid.

1386. HJELMQVIST, H. 575.255:634
Studien über Pflanzenchimären. (**Studies of plant chimaeras**).
Acta Univ. Lund 1944 : **40** : No. 7 : 1–68.

Three groups of periclinal chimaeras are described: (1) a pear-apple from Brandstorp, a Graf Moltke pear and pear wilding, and *Cerepadus* in which *Prunus Cerasus* forms the outer layers and *P. fruticosa* x *P. Maackii* the inner layers; (2) laciniate leaved variations of *Fagus sylvatica* L. var. *laciniata* Vignet, *Carpinus Betulus* L. var. *incisa* Ait., *Quercus Robur* L. var. *heterophylla*, *Betula pendula* Roth x *B. pubescens* L. var. *urticifolia* (Spach), *Tilia platyphyllos* Scop. var. *laciniata* K. Koch, *Rhamnus Frangula* L. var. *angustifolia* Loud., *Fraxinus excelsior* L. var. *aureo-variegata* West; (3) chimerical forms showing colour variations in leaf or petal of *Rhododendron Simsii* Planch, var. *Vervaeneanum*, *Crataegus Oxycantha* L. x

C. monogyna Jacq. var. *punicea* Loud., *Rosa foetida* Herrm. var. *bicolor* Willm., and *Corylus maxima* Mill. var. *purpurea* Rehd. The constitution of these chimaeras was analysed by combined morphological and cytological study. Group (3), comprising forms which are chimaeras as regards certain colour factors, was specially suitable for an investigation of the mutual influence of the different components of a chimaera.

Especially interesting is the case of *Fraxinus excelsior* var. *aureo-variegata* which proved to be a mesochimaera in which the hypodermal layer in the growing point of the shoot was abnormal and unable to form chlorophyll, whilst the layers beneath and the dermatogen were normal.

Some of the periclinal chimaeras described were obviously produced during budding. The differences between chimaeras and true hybrids are discussed. The term "vegetative hybrids" is suggested for chimaeras resulting from budding or mutation, since they result, not from the fusion of cells, but from vegetative union of neighbouring cells from different forms.

Periclinal chimaeras frequently show poor development of seed; in such cases the hypodermal layer, which is concerned with ovule development lies in a boundary region between the different forms; if, however, several cell layers in the growing point are formed of the outer component of the chimaera, the set of seed is better. In the case of *Cerapadus*, the fairly good set and germination of seed, is attributed to the fact that surrounding tissue was all formed from *P. Cerasus*. E. W.

ORIGIN OF SPECIES 576.1

1387. BOERGER, A. 576.12
La teoría de la evolución a la luz de la genética moderna. **(The theory of evolution in the light of modern genetics).**
Rev. Univ. B. Aires 1947 : **4** : No. 3–4 : Pp. 16.

A general exposition is given of the bearing of present-day genetical conclusions on the theory of evolution. It is pointed out that no satisfactory explanation has yet been advanced for the origin of life. It is also open to debate whether the microevolutionary changes observed by geneticists provide an adequate basis for explaining the macroevolutionary changes evidenced in the fossil record. The author concludes with a discussion on natural and artificial selection, and on its relevance to plant and animal breeding, and to eugenics.

1388. MUKHOPADHYAYA, B. 576.12
Biological concepts.
Sci. and Cult. 1947 : **12** : 519–24.

A discussion of different ideas concerning evolution is included.

1389. SMALL, J. 576.12
Quantitative evolution-IX. Distribution of species-durations, with three laws of organic evolution.
Proc. R. Irish Acad. 1948 : **51** : Sect. B. Nos. 17–21 : 261–78.

The following three laws relating to the evolution of species in diatoms and other groups are formulated:—

I. (*a*) Each species is basically and innately stable for a certain stable period, after which the specific pattern ceases to be capable of exact reproduction.

(*b*) This stable period is either long or short: "long" being up to about 100 million years for diatoms or less in many other groups; "short" being down to less than 1 million years for diatoms or much shorter in many other groups.

II. Species with short stable periods cease to be capable of reproduction after a short existence, even in a favourable external environment.

III. Within the long stable periods, at more or less regular intervals of time, as measured in millions of years, one organismal unit individual in each long-lived species of a genus becomes unstable in its reproductive mechanism, and undergoes the process of specific mutation, giving rise to a new species.

The operation of these laws has been modified to some extent by existing conditions, e.g. some potentially long-lived species have become extinct prematurely.
Evanescent or short-lived species are defined as those whose duration is confined to one or two geological subperiods, permanent or long-lived species as those whose duration extends into not less than three successive subperiods.
The main ratios of evanescent to permanent species for the Centrales, Fragilariaceae and allogamous Pennales are analysed in relation to time and are shown to be approximately 3 : 1, 10 : 6 and 7 : 9, respectively. The significance of the deviations from these ratios in the various subperiods is considered. It is concluded that the type of duration of the various species within each group has been under some kind of control which is characteristic of the group. It is shown that the various ratios have been maintained not only in time and in groups of genera but in single genera considered for the whole of their existence and in larger genera per subperiod. Some small homogeneous genera, however, contained only evanescent species or only permanent species. In the diatoms, species duration has been independent of speciation in so far as the origin of new species has not necessarily involved the extinction of the parent species. It is concluded from the regularity with which the ratios have been maintained, that, except in relatively few species, there is no evidence in the geological records of any extensive or significant action of the oceanic environment on the extinction of species. It is contended also that the results eliminate the possibility of the duration of the majority of species being determined by chance and the influence of the environment; species duration is thought to be an inherited characteristic of each species, both speciation and species duration being dependent on definite laws operating within certain limits.

1390. SMALL, J. 576.12
Quantitative evolution-X. Generic sizes in relation to time and type.
Proc. R. Irish Acad. 1948 : **51** : Sect. B. Nos. 17–21 : 279–95.

The number of species per genus in the three main groups of diatoms is discussed in relation to the two factors limiting speciation, time and ratio of evanescent to permanent species (cf. Abst. 1389). Relations between generic size and species duration type are demonstrated also within each of the groups formed by the large genera, medium-sized genera and small genera, and by the extinct genera, recent genera and those with both fossil and recent records. It is maintained that species duration in the diatoms is an inherited characteristic.

1391. SMALL, J. 576.12
Quantitative evolution.-XI. Speciation rates in diatoms.
Proc. R. Irish Acad. 1948 : **51** : Sect. B. Nos. 17–21 : 296–310.

It is clear from the fossil record of diatoms that, as a general rule, new species have arisen as a result of single mutations, not by gradual changes. The speciation rate, *sr*, for each genus in each geological subperiod can be calculated by dividing the number of species known to have arisen in the subperiod by the number of existing species available as sources of new species at the beginning of the subperiod.
In this paper an analysis is presented of the range of *sr* values and their frequency distribution throughout the generic histories of the diatoms. The narrowness of the limits within which the *sr* values have varied shows that speciation of diatoms during the tertiary period has followed a definite plan which appears quite incompatible with the usual theory of natural selection determining the course of evolution. The mutation rate would seem to depend rather on the number of species available as sources than on the number of individual organisms available.

1392. SMALL, J. 576.12
Quantitative evolution-XII. Frequency-distributions of generic sizes in relation to time.
Proc. R. Irish Acad. 1948 : **51** : Sect. B. Nos. 17–21 : 311–24.

The frequency distributions of sizes of diatom genera for the ten geological subperiods of the tertiary and for the Recent period have been computed and the data for the three main groups of diatoms analysed. The results show that there may be at least three types of

distributions. The development of the Centrales is regarded as the basic type. It is suggested that the double logarithmic frequency distribution of generic sizes may be an index to the type of past history of any group of plants or animals.

1393. SMALL, J. 576.12
Quantitative evolution-XIII. Basic evolution. The meaning of the diatom diagram.
Proc. R. Irish Acad. 1948 : **51** : Sect. B. Nos. 17–21 : 325–46.

The history of the Centrales shows the following characteristics which may be shared by the Compositae, grasses, conifers, and various animal groups, all of which are said to resemble the Centrales in their evolutionary development. 1. About a quarter of the new species in each subperiod have been "permanent" (*p*) and the rest "evanescent" (*e*). 2. The tendencies towards permanence and evanescence are inherited. Most new species have arisen from permanent species. 3. Speciation has occurred by means of sudden, usually single mutations, and has not involved the extinction of the parent species. Such mutations have taken place once in 8 ± 6 or perhaps 9 ± 5 million years per species. 4. Speciation has tended to be regular in the following ways: (*a*) new species have arisen from long-lived species at more or less regular intervals; (*b*) in many of the larger genera, speciation has tended to increase with the number of living species in the same genus and has followed a geometrical progression; (*c*) The number of species has doubled itself in a basic free "doubling-period" of about 2 to 8 million years, but this has been changed by the extinction of about three quarters of the new species to 6 to 24 million years; and (*d*) "speciation has been balanced with the producing of new genera in such a way that the distributions in groups of the sizes of genera have always had a "normal" agreement, but were sometimes different to a greater or smaller degree". 5. The balance between evanescent and permanent species shows that the control of the distribution of the two kinds of species has been cytogenetical. Such ratios may be altered to some extent by environmental factors.
It is thought that the scheme outlined above would account for many of the known facts in the evolution of groups of organisms.
An argument for the particulate inheritance of species duration is advanced. For most genera of the Centrales, which show both kinds of species duration, a one-unit control of species duration is inferred.
It is suggested that a gene *E* for evanescence is dominant to *p* for permanence in the Centrales, while in the allogamous Pennales and some genera of the Centrales, long species-duration is controlled by the combined action of *p* and a dominant gene for longevity.
Finally, basic evolution is defined and the facts for which it can account briefly are indicated.

1394. STEBBINGS, G. L. (jun.) 576.12:56:576.356.5:581.9(71+73)
Evidence of rates of evolution from the distribution of existing and fossil plant species.
Ecol. Monogr. 1947 : **17** : 149–58.

Evidence from palaeobotany, the distribution of allopolyploids and the existence in a restricted area of clusters of closely related species is discussed in connexion with the problem of the rates at which evolution occurs. The course of angiosperm evolution in North America is shown to comprise periods of rapid evolution alternating with times of relative stability, and this can be explained on the basis of the hypothesis that evolutionary rates are controlled through interaction between the environment and the species population.

1395. JUST, T. 576.12:56:581.9(71+73)
Geology and plant distribution.
Ecol. Monogr. 1947 : **17** : 127–37.

The evolution of vascular plants is discussed in the light of the modern knowledge of geological history, of palaeobotany and of the analysis of modern floras.

1396. PENNELL, F. W. 576.12:581.46
The taxonomic significance of an understanding of floral evolution.
Brittonia 1948 : **6** : 301–08.

The author reviews the probable course of evolution of the angiosperm flower, paying

special attention to pollination mechanisms. It is emphasized that, although the woody angiosperm families may in general go back to the Cretaceous, the herbaceous families may be no older than the Oligocene.

1397. Camp, W. H. 576.12:581.9·:576.312.35
Distribution patterns in modern plants and the problems of ancient dispersals.
Ecol. Monogr. 1947 : **17** : 159–83.

The geographical distributions of some present day groups of plants are described and discussed, differences in chromosome number within genera being taken into account. "Primary evolution" or the development of new types of organisms is distinguished from "secondary evolution" or speciation. It is suggested that the distribution of fossil and living angiosperms might be accounted for on the basis of a southern, not a northern, origin.

1398. Woodson, R. E. (jun.) 576.16:575.12(73)
Some dynamics of leaf variation in Asclepias tuberosa.
Ann. Mo. Bot. Gdn 1947 : **34** : 353–432.

A detailed investigation is reported on the population patterns of the three subspecies of *A. tuberosa* in the United States, viz. subspp. *interior*, *Rolfsii* and *tuberosa*, particularly with regard to their apparent introgressive hybridization. The study was based upon measurement of the apical taper, the shape of the base, medium length and medium width of the leaves of herbarium and field specimens.

1399. Makeev, P. S. 576.16:581.05
(Laws governing the location of the present centres of intensive species formation among plants).
Botaničeskiĭ Žurnal (J. Bot. U.R.S.S.). 1947 : **32** : 119–23.

This article, like that of Hohlov (cf. Abst. 697), is a criticism of Travin's article (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1632). Here Travin is criticized for having failed to explain the nature of the influence which geological activity is held to exert in speciation. It is pointed out that not all geological activity can give rise to new species, but only that activity which raises the land to an altitude sufficiently high to allow of the existence of several climatic zones between sea level and summit. Furthermore, altitude alone is not sufficient. For example, in the arctic regions, plant life is only just possible even a little above sea level. In the tropics, the temperature at high altitudes permits the growth of rich plant life, but the equal distribution of the abundant moisture at all altitudes fails to provide the necessary climatic diversity for more than a limited degree of species formation. The author suggests that the regions where the greatest variety of vertical climatic zones and therefore of species occurs, are to be found among the mountains situated in deserts of the temperate zone, areas with a Mediterranean climate, and in savannah regions.

*CYTOLOGY 576.3

1400. Schrader, F. 576.3
The quarter-centuries of cytology.
Science 1948 : **107** : 155–59.

The progress of cytological studies during the periods 1875–1900, 1900–1925 and 1925 to the present time is reviewed; much of the article is devoted to a discussion of the "new cytology" for which Darlington is mainly responsible.

1401. Di Stefano, H. S. 576.312:581.192
A cytochemical study of the Feulgen nuclear reaction.
Proc. Nat. Acad. Sci. Wash. 1948 : **34** : 75–80.

An investigation is reported of chemical changes undergone by the nucleic acid molecule when the nuclei of cartilage cells are treated with Feulgen solution. The possibility of making quantitative determinations of desoxypentose nucleic acid by means of the Feulgen reaction is discussed.

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* General studies, see also individual crops.

1402. Blout, E. R. and
Fields, M. 576.312:581.192:537.61–15:632.422.3
On the infrared spectra of nucleic acids and certain of their components.
Science 1948 : **107** : p. 252.

Preliminary results are reported of experiments to determine infra-red absorption in the region 700–1000 cm.$^{-1}$ by yeast ribonucleic acid and thymus desoxyribonucleic acid and some of their chemical constituents.

1403. Gulland, J. M. and
Jordan, D. O. 576.312.2:581.192:632.422.3
Structure of yeast ribonucleic acid.
Nature, Lond. 1948 : **161** : 561–62.

Evidence concerning the structure of yeast ribonucleic acid is reviewed.

1404. Westergaard, M. 576.312.332:577.8:575
The relation between chromosome constitution and sex in the offspring of triploid *Melandrium*.
Hereditas, Lund 1948 : **34** : 257–79.

An investigation of the inheritance of sex in *Melandrium* had led to the conclusion that the Y chromosome and some of the autosomes are male promoting and the X chromosome and the rest of the autosomes female promoting. Sex is determined by the quantitative interaction of the male and female promoting genes located in all the chromosomes on the one hand and the sex-deciding genes confined to the differential part of the Y chromosome on the other. The male and female promoting genes, acting alone would produce a bisexual plant. The Y chromosome when present determines maleness by suppressing the development of the female organs; in the absence of the Y chromosome the development of the male organs is blocked. The general principles of sex determination in dioecious plants and the evolution of the mechanism of sex determination are discussed.

1405. Kaufmann, B. P. 576.312.34:576.35
Chromosome structure in relation to the chromosome cycle. II.
Bot. Rev. 1948 : **14** : 57–126.

Recent literature on the structure of chromosomes as revealed by the various modern analytical techniques as well as by direct observation is reviewed, and present-day knowledge concerning chromosome structure is discussed with reference to the mechanism of the changes undergone by the chromosomes during the mitotic cycle. The mechanism of coiling in discussed at some length.

1406. Östergren, G. 576.312.34:578.65
Proximal heterochromatin, structure of the centromere and the mechanism of its misdivision.
Bot. Notiser 1947 : 176–77.

By means of a new staining technique involving crystal violet, and by means of an alternative technique involving mild killing agents, it has been discovered that the actively motile component of the centromere is longitudinally divided as early as the beginning of prophase. Moreover the two "spindle spherules" into which the centromere is divided are themselves double, each consisting of two heterochromatic masses separated by a transverse division. The spindle fibre also appears to be double.
Should division occur along the transverse cleft of the spindle spherules, misdivision of the chromosome results.

1407. Howard, H. W. 576.312.35:581.5
Chromosome number of *Cardamine pratensis*.
Nature, Lond. 1948 : **161** : p. 277.

Four *C. pratensis* plants from different localities were found to have $2n = 56$ chromosomes. The fact that they all came from rather wet situations, while material with $2n = 30$ examined by Lawrence came, apparently, from a rather dry place, confirms Lövkvist's conclusion (cf. Abst. 1408), that chromosome numbers are correlated with dampness of habitat.
It is reported that 56 chromosome plants commonly had two univalents.

1408. Lövkvist, B. 576.312.35:581.5
Chromosome studies in *Cardamine*.
Hereditas, Lund 1947 : **33** : 421–22.

Cytological investigations undertaken to elucidate the relationship between *C. pratensis* and *C. dentata* have revealed the existence of a series of chromosome races of which these two species are probably the extreme types. Races with $2n = 30$, 56, 60, 64, 68, 72 and 76 chromosomes were found and some plants with 58 and 84 chromosomes. Meiotic irregularities were noticed in plants with $2n = 30$ chromosomes.
Plants of different races growing together in meadows are always distributed so that those with 30 chromosomes are in the higher parts, those with 56, 60, 64 and 68 in the lower parts, and those with 72 and 76 in or near water. It is therefore concluded that higher chromosome number is correlated to higher water content of the soil.

1409. 576.312.35:581.9:582
576.312.35:581.9:815.192
Simonet, M. 575.127.2:576.354.4
Les Iris et leur comportement aux points de vue systématique, génétique, cytologique, géographique et chimique. (**The iris species and their behaviour from the systematic, genetical, geographical and chemical points of view**).
Arch. Klaus-Stift. VererbForsch. 1947 : **22** : 307–25.

It is shown that morphological variations among *Iris* species correspond to differences in chromosome numbers which are related also to geographical and chemical differences. The species with the highest chromosome numbers are distributed furthest from the hypothetical centre of origin of the genus, the eastern Mediterranean region, and those with the basic chromosome number ($x = 8$) are found actually in this region.
Hybridization has occurred between different groups of species, interspecific hybrids being intermediate between the parents. In hybrids between closely related species with the same chromosome number meiosis is usually normal, but univalents are sometimes present. In hybrids between species with different chromosome numbers meiosis is nearly always irregular except for some examples of complete autosyndesis. The various types of anomalies are indicated together with examples of hybrids in which they occur. When autosyndesis is complete, the plants are stable and fertile and can be considered new species. On the basis of their glucosides, the *Iris* species are divisible into three groups. The chemical differences correspond to morphological, genetical, cytological and geographical ones.

1410 Satyanarayana Rao, N. 576.312.6:633.372
A case of cytomixis in *Crotalaria medicaginea* Lamk.
Curr. Sci. 1948 : **17** : p. 27.

The occurrence of cytomixis in the root-tip cells of *C. medicaginea* is reported. Observations by the workers on cases of cytomixis are briefly reviewed, and the possible cause of the cytomixis observed by the author is discussed.

1411. Östergren, G. 576.35:53
Transverse equilibria on the spindle.
Bot. Notiser 1945 : 467—68.

It is suggested that if the spindle is a tactoid, the presence of the chromosomes will disturb the dynamic equilibrium set up by the mobile particles. It may therefore be expected that two transverse forces will act on the metaphase chromosomes, a centrifugal eliminative on the chromosome arms, and a centripetal force from the poles on the centromeres. The general configuration of metaphase plates, in which the centromeres tend to lie towards the centre and the chromosome arms tend to lie towards the periphery is believed to support this conjecture.

1412. Lettré, H. and
Lettré, R. 576.35:581.04
Aufhebung der Mitosegiftwirkung metallorganischer Verbindungen. (**Neutralizing the mitosis inhibiting effect of organo-metallic compounds**).
Naturwissenschaften 1947 : **34** : p. 127.

Three types of compounds inhibiting mitosis are considered: (1) trypaflavin and its

analogues, (2) organo-metallic compounds, and (3) colchicine. The inhibitory effect of trypaflavin can be neutralized by the addition of nucleic acids, that of the organo-metallic compounds by the addition of compounds containing the SH–radicle, while the chemical basis of the colchicine effect remains unknown. The growth inhibiting properties of 8–oxychinolin can be counteracted by mercury methyl chloride.

1413. Bloch, R. 576.35:581.143.24
Differential cell divisions and the problem of cellular diversity in plant tissues.
Amer. J. Bot. 1947 : **34** : 580–81. (Abst.)

Different theories to account for histological differentiation are considered. It is concluded that differential cell divisions are of particular interest in this connexion.

1414. Mehra, P. N. 576.353:581.04:633.88
Colchicine effect on the mitotic division of the body nucleus in the pollen grains of some *Ephedra* sps.
Proc. Nat. Inst. Sci. India 1946 : **12** : 333–40.

The effect of 0·2% concentration of colchicine upon mitosis was studied in pollen grains of *E. foliata, E. intermedia, E. sinica* and other species of *Ephedra.* It was observed that the colchicine inhibited spindle formation, when the mitotic division was allowed to begin in the presence of the solution, and also resulted in the collapse of the spindle when the solution was applied at the metaphase, anaphase or telophase stages. During metaphase and anaphase the free and straightened chromosomes became scattered. The chromosomes exhibited sensitivity to colchicine; in some cases a high degree of longitudinal chromosome contraction accompanied by a corresponding increase in thickness was observed; this was due to the high degree of spiralization of the chromonemata. The satellites, secondary constrictions and centromere were unaffected, and the chromosomal cycle was not found to be retarded. The further contraction of the elongated double chromosomes after prophase and the splitting of the daughter chromosomes prior to their organization in restitution nuclei both occurred normally in the colchicine treated material, indicating that these processes are independent of the spindle. The number and form of the nuclei reconstituted from the scattered chromosomes were variable. In many cases a single round diploid nucleus was produced. A large amoeboid diffuse nucleus was often formed; in other cases a number of nuclei of varying sizes and shapes, some connected by bridge-like processes, were observed.

1415. 576.354.4
576.312.332
576.313
Revell, S. H. 576.312.381
Controlled X-segregation at meiosis in *Tegenaria.*
Heredity 1947 : **1** : 337–47.

Meiosis in male spiders with 40 autosomes plus sex chromosome complements of the XXO and XXX types respectively is described.

It is thought that the intra-bivalent repulsions, the sudden increase of which probably breaks up polarization at the onset of diplotene in most animal mitoses, are adjusted in *Tegenaria* in order that the X chromosomes may be kept together, with the result that polarization continues, as observed, until anaphase. The attraction causing polarization of the chromosome ends is evidently to the centrosomes since the chromosomes follow these as they move round the nuclear membrane. It is concluded from the behaviour of the chromosome at the time of spindle formation that the centromeres are repelled by the poles and that during the polarized stage this repulsion is in equilibrium with the attractive force between the chromosome ends and centromeres.

Bernal's tactoid hypothesis is discussed in the light of observations on chromosome behaviour in *Tegenaria.* The fact that bivalents with terminal chiasmata tend to move first on to the metaphase plate may mean that their movement is influenced by the size of the negative tactoid formed by each bivalent. The relative uniformity in size of the autosomes

may be an adaptation to reduce such differences in chromosome reactions as much as possible. The failure of the X group to become orientated on the plate is accounted for by its having only a single undivided centromere and therefore no negative tactoid.

1416. Sprinath, K. V. 576.354.46
Crossing-over.
Sci. and Cult. 1947 : **12** : 561–64.
Various theories concerning the mechanism of crossing-over are reviewed.

1417. Nybom, N. 576.356
Note on a case of sticky chromosomes and cytomixis.
Bot. Notiser 1946 : 123–24.
Meiosis in a tetraploid plant of *Primula malacoides* which had been kept for some time under unfavourable room conditions was found to be characterized by the occurrence of chromosome agglutination and cytomixis.

1418. Sparrow, A. H. 576.356:537.531
Differential rejoining as a factor in apparent sensitivity of chromosomes to X-ray breakage.
Amer. J. Bot. 1947 : **34** : p. 589. (Abst.)
Taking the number of chromosome fragments as a rough index of sensitivity of the chromosomes to X-ray fragmentation, and the number of bridges and rings as an index of the rejoining of broken ends, the amount of rejoining of *Trillium* chromosomes at different stages of division relative to the X-ray sensitivity of the chromosomes at those stages was investigated. The results indicate that the rejoining of broken ends probably affects the apparent sensitivity of chromosomes to X-ray breakage.

1419. Villars, R. 576.356:537.531:578.08
Les études cytologiques sur l'action des rayons X sur les organismes supérieurs. (**The cytological studies on the action of X-rays on the higher organisms**).
Rev. Gén. Bot. 1947 : **54** : 354–80.
The size of X-ray doses used in irradiation experiments is discussed, and a survey is presented of the effects, including chromosome aberrations, of X-irradiation on various kinds of cells in the higher animals and plants.

1420. 576.356:537.531:635.25
Conger, A. D. 576.312.34:635.25
X-ray sensitivity of the stages of mitosis.
Amer. J. Bot. 1947 : **34** : p. 582. (Abst.)
The chromosomal aberration frequencies of onion root-tip cells X-rayed at different stages of division were found to be approximately 1·7 to 3·4 from early to late prophase, 11·8 at anaphase, and 37 at metaphase, where the value during the resting stage was taken as unity. Evidence was obtained that the chromosome reacts to X-rays as though it consisted of four strands at metaphase and two at anaphase.

1421. Swanson, C. P. 576.356:537.61–15:537.531
The effect of infrared treatment on the production of X-ray induced changes in the chromosomes of *Tradescantia*.
Amer. J. Bot. 1947 : **34** : p. 590. (Abst.)
The results of experiments in which X-rayed microspore chromosomes of *Tradescantia* were exposed to infra-red rays at varying intervals after X-irradiation suggest that the recombination of broken ends of chromosomes may be effected at least four hours after chromosome breakage. The rate of translocation was significantly increased by the infra-red treatment, while the production of single or double deletions was affected very little or not at all.
Other experiments have shown that infra-red treatment is equally effective in increasing all types of induced chromosomal changes when administered 96 hours before X-irradiation. The significance of the results of both sets of experiments is indicated.

1422. Walters, M. S. and
Gerstel, D. U. 576.356:576.354.46
A cytological investigation of a tetraploid *Rhoeo discolor*.
Amer. J. Bot. 1948 : **35** : 141–50.

A study of meiotic metaphase and subsequent stages in a spontaneous tetraploid of *Rh. discolor* the diploid form of which is a translocation heterozygote, and its selfed progeny, is reported. The types and frequencies of metaphase configurations observed in the tetraploid material are compared with expectations based on random pairing and with corresponding observations on the diploids. The chiasma frequencies of the tetraploids and and diploids are also compared and discussed. Several explanations of the fact that, in both, the chiasmata are localized at the ends of the chromosomes, are considered. Most of the tetraploids were aneuploids. Their pollen fertility was more than twice that of the diploids.

1423. Pao, W. K. and
Li, H. W. 576.356:581.036:633
Desynapsis and other abnormalities induced by high temperature.
J. Genet. 1948 : **48** : 297–310.

The effects of high temperature treatment upon meiosis in wheat, rye, barley, vetch and broad bean plants were investigated. Spindle formation was disturbed and disjunction did not occur. A high frequency of univalents which is attributed to the prevention of crossing-over between the homologous chromosomes at early prophase by the insufficiency or excess of some substance influencing crossing-over was caused as an after-effect of the heat treatment.

1424. Fuller, T. C. 576.356:581.04
Effects of several sulfa-compounds on nuclear and cell division.
Bot. Gaz. 1947 : **109** : 177–83.

The effects of solutions of sulphanilamide, sulphadiazine, sulphaguanidine, sulphamerazine, sulphapyridine and sulphathiazole on root-tip mitosis in *Allium Cepa* are described.

1425. Parmentier, R. and
Dustin, P. (jun.) 576.356:581.04
Early effects of hydroquinone on mitosis.
Nature, Lond. 1948 : **161** : 527–28.

Abnormal mitoses in cells of the small intestine of the mouse injected with hydroquinone are described and various hypotheses to explain the way in which they are brought about are discussed.

1426. Arnason, T. J.,
Cumming, E. and
Spinks, J. W. T. 576.356:581.04:539.16
Chromosome breakage in plants induced by radioactive phosphorus.
Science 1948 : **107** : 198–99.
Radiophosphorus upsets chromosomes.
Discovery 1948 : **9** : p. 131.

Preliminary experiments on the induction of mutations by radioactive phosphorus (P^{32}) were carried out on *Triticum aestivum* L., variety Thatcher (n — 21), *T. durum* Desf., variety Pelissier (n = 14), *T. monococcum* L. (n = 7), and *Hordeum distichum* L., variety Hannchen (n = 7). The plants were treated as germinating seeds or young seedlings. Subsequent examination of the pollen mother cells of the *T. aestivum* and *T. durum* plants revealed chromosome aberrations including fragments, chains of three or four chromosomes, rings of four, unequal pairs, and anaphase and telophase bridges. Only one of the heads of *T. monococcum* showed chromosome breakage and rearrangement. No clear aberrations were detected in the barley.

Aberrations were found also in Thatcher wheat plants grown in soil to which a fertilizer containing radioactive phosphorus had been added, and anaphase-I bridges were detected

in pollen mother cells of a sunflower head which had been injected with radioactive phosphorus.

1427. Eigsti, O. J., Greenspahn, W. C. and Knight, J. R. 576.356:581.04:578.08
A method for testing effectiveness of certain chemical substances upon cell-division.
Amer. J. Bot. 1947 : **34** : p. 594. (Abst.)

The effectiveness of a number of organic chemical substances upon the division of the generative cell was tested by growing pollen tubes in media containing them.

1428. Łączyńska, T. 576.356:581.04:578.08
The threshold values of colchicine action in some cultivated plants.
Ann. Univ. Mariae Curie-Skłodowska Lublin-Polonia 1948 : **3** : Sect. C : 43–50.

Various concentrations of colchicine were applied to germinating seeds of flax, rape, turnip, clover and soya beans and to the corresponding tetraploids except in the case of soya beans where only diploids were studied. The roots were fixed after 6 and 24 hours and the effects of the colchicine on mitosis in their tips compared. The threshold concentrations, i.e. the least which produced any mitotic effect at all ranged from 25 to 500 $\times$ 10^{-6} mol./l and were lowest for clover and highest for flax and rape, tetraploids and diploids giving similar results in this respect. In the tetraploids, however, the colchicine produced its full effect in 6 hours whereas the diploids showed the same effect after 24 hours. Threshold values were lower for onion and flax grown in distilled water than in Knop's solution.
Cytological investigations showed that colchicine treatment causes small chromosomes to group together into irregular clumps probably as a result of stickiness. The large chromosomes of *Allium*, on the other hand, are scattered during c-mitosis.
Root and stem growth was inhibited by high concentrations of colchicine. The threshold values correspond quite well with those for mitotic effect, and in general this is true also of tumour formation.

1429. 576.356:581.04·578.08
Singh, S. P. 635.659:576.356:581.143.26.04
A new method of application of acenaphthene.
Sci. and Cult. 1947 : **12** : 593–94.

A method of treating seeds with acenaphthene in lard is described.
The effects of acenaphthene treatment on *Cajanus* cells are described. It is thought that chromosome doubling might be induced by varying the concentration of the acenaphthene and the duration of the treatment.

1430. Madsen, G. C. 576.356:581.143.26.035.1
Influence of photoperiod on microsporogenesis in *Cosmos sulphureus* Cav. var. Klondike.
Bot. Gaz. 1947 : **109** : 120–32.

An account is given of the abnormalities induced in the microsporogenesis of a short-day strain of *C. sulphureus* by artificially increasing the day length.

1431. Gentcheff, G. [Genčev, G] 576.356:581.331.2:581.163
(Degenerative phenomena in the male gametophyte of *Hieracium* in relation to mitotic and meiotic behaviour of the cell).
Annu. Univ. Sofia V. Fac. Agron. Sylvicult. Livre 1. Agron. 1940–1941 : **19** : 107–50.

An account is given of the chromosome numbers, meiosis in the pollen mother cells, and tapetal development of 60 different *Hieracium* apomicts. Various kinds of aberrant meioses in the pollen mother cells are reported, and, in *H. umbellatum* f. *apomicta*, a purely somatic division instead of meiosis. In *H. racemosum* no chromosome differentiation was seen in the pollen mother cells. Double reproduction of the chromosomes occurred in four species. The type of pollen produced is correlated with the anomalous chromosome behaviour, type of wall formation and the peculiar degenerative phenomena which are

described. There is no apparent correlation between the division in the pollen mother cells and Zahn's taxonomic arrangement of the species. Parallel observations on the behaviour of pollen mother cells and the development of the tapetum lead to the conclusion that somatic division in the pollen mother cells and some of the aberrant types of meiosis which were observed represent transitions between the mitotic and meiotic condition in the cell. The existence of a balanced system with respect to the mutual relation of tapetum and pollen mother cell development is deduced. This is attributed to the presumed physiological effect of polyploidy in the tapetal cells, which effect is supposed to include the production of meiotic substances. The observed anomalies in the development of the pollen grains in *Hieracium* are attributed to the upset of the "meiotic" balance. This theory accounts for the meiotic division in the pollen mother cells of *H. umbellatum* f. *apomicta*, for this division occurred before the advanced stages of tapetal development and hence, presumably, before the production of the meiotic substances. The nature of the causes disturbing the supposed balance is discussed, the fact that meiotic abnormalities in experimentally produced *Hieracium* tetraploids correspond to those of the diploids being taken to prove that the disturbance observed in the development of the tapetum and pollen mother cells are genetically determined. It is thought that the action of the genes concerned is to change the rate of some developmental processes during the differentiation of the male gamete.

1432. Nybom, N. 576.356:635.26
Non-random distribution of chromosomes at meiosis in triploid *Allium Schoenoprasum*.
Bot. Notiser 1947 : 55–60.

The distribution to the poles of the satellited chromosomes of triploid *A. Schoenoprasum* during meiosis is non-random. The satellited chromosomes show a preferential tendency to migrate to the pole with the greater number of chromosomes. Possible explanations for this behaviour are suggested.

1433. 576.356.4:576.6
Östergren, G. 576.356.4:575.41
Parasitic nature of extra fragment chromosomes.
Bot. Notiser 1945 : 157–63.

The accessory chromosomes of rye and possibly of some other plants appear to be disadvantageous to the plants bearing them. It is suggested, therefore, in view of the probable antiquity of these extra chromosomes that they are essentially parasitic, and that natural selection acts on them as though they were entities in themselves and not merely components of the plants carrying them. In this way any cytological mechanism assisting in the accumulation of accessory chromosomes may be regarded as of positive selective value from the point of view of the supernumerary chromosomes, though not from that of the host plant.

1434. Heiser, C. B. (jun.) and
Whitaker, T. W. 576.356.5:575.41:632.51
Chromosome number and growth habit in California weeds.
Amer. J. Bot. 1947 : **34** : p. 584. (Abst.)

The observation that 51% of the 175 typical Californian weeds investigated are diploid and 49% polyploid suggests that, in general, polyploidy is not important in determining whether a particular species will become a successful weed. Among the monocotyledons, 65% are polyploids. Annual polyploids appear to be the most efficient weeds in the Gramineae and to a much less extent in the Compositae.
It is concluded that the significance of polyploidy can be assessed only by careful investigations of families and genera and that it is unsafe to generalize.

1435. Heiser, C. B. (jun.) and
Whitaker, T. W. 576.356.5:575.41:632.51
Chromosome number, polyploidy, and growth habit in California weeds.
Amer. J. Bot. 1948 : **35** : 179–86.

This is the full account of the results referred to in Abst. 1434.

1436. Atchison, E. 576.356.5:576.16
Cytogeography of *Gleditsia* and *Mitchella*.
J. Hered. 1947 : **38** : 311–12.
No evidence of intraspecific polyploidy has been found in *G. triacanthos* and *M. repens*, in contradiction of the suggestion made by other investigators that polyploidy is probably a characteristic of many species found in the Appalachians as a result of changes in the climate and topography of this region.

1437. Ciferri, R. and
Ciferri, F. 576.356.5:581.04:633.367
Attività colchicinosimile di sulfamidici sulla crescita del lupino e potere antisulfamidico dell' acido ribonucleico e dell'adenina. (**Colchicine-like action of sulphamides on the growth of lupin and the anti-sulphamidic capacity of ribose nucleic acid and adenine**).
Atti Ist. Bot. Univ. Pavia 1947 : **3** : 333-36.
An enumeration is presented of a number of compounds which have effects resembling those of colchicine, followed by a description of the authors' own results in treating seedlings of *Lupinus albus* with solutions of sulphonamide, sulphothiazole and sulphopyrimidine, all of which gave similar effects. The addition of adenine or ribose nucleic acid diminished the effect of all three substances.

MICROSCOPIC TECHNIQUE 578.6

1438. Lorz, A. P. 578.67
A simplified diffusion—dehydration technique in the microtomy of tissues.
Science 1948 : **107** : 278–79.
A convenient method of dehydrating bundles of root tips and embedding them in paraffin wax for microtoming is described.

*BOTANY 58

1439. Kugler, I. 581.142:581.035:575.115
Effect of light on the germination of several strains of *Arabidopsis Thaliana* L. Heynh.
British Intelligence Objectives Sub-Committee, London 1947 : Final Rep. 1094 : Pp. 23.
The effect of light and of darkness on the germination of four strains of *A. Thaliana* L. Heynh. was tested. Some races need light, but can germinate in darkness, others must have light, and others are indifferent. Crosses between races of the second and third groups proved indifference to illumination to be a dominant character, and the tabulated percentages of germination from reciprocal crosses showed that the cytoplasm affects the inheritance of the factor which makes light essential for germination. E. W.

1440. Härer, L. 581.145.1:575"793"
Die Vererbung des Blühalters früher und später sommereinjähriger Rassen von *Arabidopsis Thaliana* (L.) Heynh. (**The inheritance of the blossoming time of early and late blooming summer annual strains of *A. Thaliana* (L.) Heynh.**
British Intelligence Objectives Sub-Committee, London 1947 : Final Rep. No. 1090 : Pp. 27.
Five pure lines from wild races of *A. Thaliana* L. Heynh. were used in studying the inheritance of time of flowering under constant environmental conditions.
Distribution curves for the flowering times of the separate lines and of the reciprocal hybrids suggest monofactorial segregation of early and late flowers with the factor for late flowering incompletely dominant. It is very probable that multiple allelomorphs of this gene cause the different degrees of early and late flowering. Under unfavourable conditions; e.g. short day, other modifying genes came into play.

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* General studies, see also individual crops.

Pubescence of the leaves is a dominant monofactorial character inherited independently of the time of flowering. E. W.

1441. SCHROEDER, C. A. 581.162.32:578.08
A convenient plant pollinating kit.
Science 1948 : **107** : p. 354.

Simple apparatus to facilitate the hand pollination and labelling of plants and the recording of pollinations in the field is described.

1442. BATEMAN, A. J. 581.162.32:633
Contamination in seed crops. III. Relation with isolation distance.
Heredity 1947 : **1** : 303–36.

Observations on the pollinating methods of bees are recorded and insect pollination is contrasted with wind pollination. For insect pollinated crops the formulae $F = ye^{-kD}$ and $F = \frac{ye^{-kD}}{D}$ are derived to express the variation of contamination, F, of one variety by another according to the distance, D, between them. The corresponding formula obtained for wind pollinated crops is $\frac{F}{1-F} = \frac{ye^{-kD}}{D}$. The agreement of these formulae with experimental results obtained for various crops is demonstrated. If F is so small that $F = \frac{F}{1-F}$, one formula, $F = \frac{ye^{-kD}}{D}$ can be used in all cases to predict contamination at a given distance when the values at two other distances are known. The formula is of interest also in connexion with the breeding behaviour of natural populations.

1443. YATES, F. 581.162.5:519.24:633.323
Analysis of data from all possible reciprocal crosses between a set of parental lines.
Heredity 1947 : **1** : 287–301.

A method of analysis of the data obtained by making all possible reciprocal crosses between a number of normally cross-fertilized parental lines is described. Cases of self-sterility without group incompatibility, absence of self-sterility, and self-sterility with mutually incompatible groups are considered, and the last of these is illustrated by a numerical example based on data giving the fertility in reciprocal crosses of 12 sibs of an F_1 family of *Trifolium hybridum*.

1444. CHRISTOFF, M. [HRISTOV, M.] 581.163
(Apomictic reproduction in the plant kingdom).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1. Agron. 1942–1943 : **21** : 101–03.

In plant groups comprising large numbers of apomictically reproducing species, when a factor determining apomictic development comes into play as a result of hybridization, the conditions are provided for polyploidy and for variation within the limits of polymorphism occurring in nature. E. W.

1445. HOHLOV, S. S. 581.163
(Apomictic reproduction of plants and some questions of plant industry).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : No. 1 : 55–70.

The various forms of apomictic reproduction are described and it is shown that many of the characteristically apomictic species are vigorous in the sense that they have a large number of individuals, a large area, a large number of systematic units and a high rate of reproduction. These are the characteristics of progressive rather than degenerate species. Such forms preserve the advantages of seed multiplication without the disadvantages associated with the sexual process, such as the perpetual impoverishment of the genetic

constitution resulting from reduction division. The aim of the plant breeder should therefore be to incorporate the advantages of apomictic reproduction as much as possible into his stocks.

1446. Tschermak-Seysenegg, E. v 581.163
Fruchtbarkeit ohne Befruchtung. (Spontane und künstlich bewirkte Parthenogenese). [**Fertility without fertilization. (Spontaneous and artificially induced parthenogenesis)**].
Anz. Akad. Wiss. Wien 1946 : No. 8 : 51–59.

A short summary is given of the various methods of producing so-called seedless fruits. A paper of the author's in 1944 (cf. Abst. 682) showed that by applying foreign pollen, dead pollen, growth substances, e.g. cereal flours, or dry powders containing vitamins to the stigmas of various plants, seeds capable of germination were sometimes produced, which gave progeny exactly like the mother plant. This method of obtaining seeds, the author terms fertilization by stimulation.

Various suggested explanations of the origin of diploidy of seedlings from seeds resulting from fertilization and stimulation, and the significance of the method of fertilization by stimulation in genetical studies of hybrids are discussed.

Experiments are being made on combining fertilization by stimulation with the production of xenia in the same individual within a single fruit, pod or ear.

An example of the combination of normal fertilization and fertilization by stimulation is described from the author's work with two races of peas. A race with green seeds was fertilized by viable pollen of a yellow seeded race; dead pollen from the yellow seeded pea was also used to stimulate the green seeded plant. The true pollination produced yellow seeds whereas stimulation produced green seeds, both colours of seeds occurring in the same pod. E. W.

1447. 581.165:575.7
Chevalier, Ch. 575.247
L'individu végétal chez les plantes supérieures. (**The plant individual among the higher plants**).
Rev. Hort. Paris 1946 : **30** : 79–80.

The nature of the individuality of the higher plants is discussed with reference to their methods of reproduction, the degeneration of varieties and the occurrence of bud mutations.

1448. Maheshwari, P. 581.331.1:582:576.12
The angiosperm embryo sac.
Bot. Rev. 1948 : **14** : 1–56.

The different types of embryo sac development in angiosperms are described and their interrelationships and the taxonomic value of embryo sac characters considered. The origin of the angiosperm embryo sac is also discussed.

1449. 581.46:575.11
Stomps, Th. J. 581.46:575.242
Kleistogamie als mendelndes Merkmal. (**Cleistogamy as a Mendelian character**).
Rec. Trav. Bot. Néerland. 1948 : **41** : 118–30.

Cleistogamy in *Oenothera disjuncta* appears to be determined by a single recessive gene. A cleistogamous mutant of *Oe. biennis* has also been reported.

1450. Fosberg, F. R. 581.6
Economic botany—A modern concept of its scope.
Econ. Bot. 1948 : **2** : 3–14.

Modern economic botany has emerged from its former limitation as a purely descriptive science. The author indicates its present much wider scope which now embraces phytopathology, breeding and genetics, taxonomy, plant physiology and several other branches of science.

1451. RICKETT, H. W. 582:001.4
Orthography in botanical nomenclature.
Brittonia 1948 : **6** : 365–68.
Various modifications in the *International Rules of Botanical Nomenclature* are proposed to meet inconsistencies in the present rulings on orthographic variants.

1452. SHERFF, E. E. 582:001.4
A name for the "alpha" variety or forma of miscellaneous dicotyledonous plants.
Brittonia 1948 : **6** : 332–42.
It is pointed out that the naming of the typical variety of a species in bound by the same rules as the naming of any other variety. A list of named typical varieties in groups studied by the author follows.

1453. PRAT, H. 585.421:582
Epidermic characters in taxonomy of cereals and grasses.
Amer. J. Bot. 1947 : **34** : p. 607. (Abst.)
The use of epidermal characters in the Gramineae to identify species and varieties, to recognize their relationships and to follow the results of hybridization is indicated.

1454. CRABTREE, D. G. 591.04:575(73)
Red squill—most specific of the raticides.
Econ. Bot. 1947 : **1** : 394–401.
An account is given of recent investigations carried out in the United States on the production and utilization of red squill [*Urginea maritima* (L.) Baker] as a substance for poisoning rats and mice. The results of experimental plantings have shown that red squill grows best in the coastal region of southern California; in this area the climate is similar to that of the Mediterranean regions in which red squill is native. Investigations on propagation are in progress at the Torrey Pines Station, San Diego, California. Selection and breeding are also being carried out with the aim of developing a strain with uniformly high toxicity and other characteristics, suitable for commercial cultivation.

AGRICULTURE 63

1455. STAHL, C. 631.521.5:633(48.9)
Beretning fra Statsfrøkontrollen for det 75. Arbejdsaar fra 1. Juli 1945 til 30. Juni 1946. (**Report from the State Seed Control Department for the 75th year of work from 1 July 1945 to 30 June 1946**).
Tidsskr. Planteavl 1946 : **51** : 189–246.
In addition to general information on the work and composition of the Danish Seed Testing Board, this report also gives particulars of

(1) the actual seed testing carried out from 1945 to 1946, and

(2) the method used, including the automatic control system reached by voluntary agreement between the Danish Seed Testing Station and seed producing firms. This agreement was described fully in the Annual Report for 1940–41.

1456. FENNELL, J. L. 631.524
Temperate-zone plants in the tropics.
Econ. Bot. 1948 : **2** : 92–99.
The behaviour of tomato varieties developed in North America, onion, maize, and various temperate zone fruits when grown in a tropical climate is analysed, with regard to the shorter day length under tropical conditions and other factors. Special reference is made to trials of temperate zone crops at Turrialba, Costa Rica. The author expresses the view that plant improvement in temperate and tropical regions should form a more complementary field of study than at present, and that genetical and other research in the tropics can provide additional opportunities of investigating problems of crop improvement in the temperate countries, such as pathological problems. The time-saving advantage of the tropical growing conditions throughout the year is also stressed.

1457. JOHNSON, J. 632–1.521.6:581.032

Water-congestion in plants in relation to disease.

Res. Bull. Wisc. Agric. Exp. Sta. 1947 : No. 160 : Pp. 36.

Experiments are reported on the factors conducive to water congestion in a wide range of plant material, a condition which predisposes plants to infection by certain bacteria and fungi, such as the wild fire bacteria of tobacco. Susceptibility to water-congestion is a heritable character, and different plant species show wide variability in their sensitivity and response to conditions favouring water congestion. The significance of susceptibility to water congestion in disease control, including selection for disease resistance, is discussed.

1458. 632.3:575
632.4:575
632.8:575

Heredity and variation in microorganisms.

Cold Spring Harbor Symposia on Quantitative Biology 1946 : **11** : Pp. 314.

Anderson, T. F. — *Morphological and chemical relations in viruses and bacteriophages.* (*pp. 1–13*).

The information at present available on the morphology and chemistry of the bacterial, plant and animal viruses is critically reviewed. A bibliography of 62 references is appended. Among the points discussed by the author is the similarity of many of the viruses to non-Mendelian entities which determine characters, such as κ in *Paramecium*, the so-called *Pneumococcus* transforming principle and the cytogene.

Bonner, D. — *Biochemical mutations in Neurospora.* (*pp. 14–24*).

Investigations on biochemical mutations in *Neurospora* induced by radiation and chemical substances are surveyed. The results have led the author to the hypothesis that a chemical reaction in the chain of reactions involved in the synthesis of a given vitamin or amino-acid by this organism depends upon a single gene, and that the genes concerned in the chain of reactions exert their effect by control of the production of specific enzymes.

A summary is included of the contributions by M. Delbrück and others to the discussion of the paper, in which the hypothesis that a one-to-one relationship exists between gene and specific enzyme is critically examined.

Bunting, M. I. — *The inheritance of color in bacteria, with special reference to Serratia marcescens.* (*pp. 25–32*).

Strain 274 of *S. marcescens* was found to show heritable specific colour variations which were easily recognizable, reversible, and independent of one another. They occurred with high frequency, and each type gave characteristic proportions of variants with marked regularity. None of the observations on colour variation in this strain of *S. marcescens* is irreconcilable with a theory of gene mutation, but the need for a critical approach in using this concept is stressed.

Delbrück, M. and Bailey, W. T. (jun.) — *Induced mutations in bacterial viruses.* (*pp. 33–37*).

The results of previous investigations by M. Delbrück and other workers on the behaviour shown by mixed infections of pairs of bacterial viruses are summarized. It has been found that in general the wild plaque type of the T group of viruses and the *r* mutation affecting plaque type are not mutually exclusive in a mixed infection of the two types belonging to a single strain, both types undergoing multiplication; that serologically related virus strains exhibit partial mutual exclusion, and unrelated viruses undergo mutual exclusion, only one of the infecting types multiplying. Mutual exclusion therefore appears to operate the more thoroughly the more dissimilar the two viruses forming the mixed infection.

The present paper reports the occurrence of mutations without alteration of host range in mixed infections of different strains consisting of pairs within the related group T2, T4 and

* General studies, see also individual crops.

T6, in which one of each pair is the wild type form of plaque and the other the *r* mutant form. The data suggest the following conclusions: (1) mutations from the wild type to the *r* type occur, or from the *r* to the wild type; (2) mutations occur only if one of the infecting types is the wild type, and the other the *r* type; when both the infecting types are wild type, or both *r* types, no mutation occurs; and (3) in the same mixed infection both infecting types may be changed, the wild type to the *r* type, and the *r* type to the wild type. The need for a closer study of the relationship between this apparent breakdown of mutual exclusion in mixed infections of closely related viruses and the occurrence of these "induced" mutations is stressed.

Demerec, M. and Latarjet, R. — *Mutations in bacteria induced by radiations. (pp. 38–50).*

Experiments on the production of bacteriophage resistant mutants of *Escherichia coli* by treatment with X-rays and ultra-violet radiation are described (cf. also *Plant Breeding Abstracts*, Vol. XVI, Abst. 1186). In most of the experiments line B/r of strain B of *E. coli* was used; this line is resistant to ultra-violet and X-ray treatment and can thus stand treatment with higher doses of radiation than strain B (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1187). Bacteriophage T1 was used to isolate the resistant mutants.

Some of the mutations induced by X-ray and ultra-violet radiation can be detected before the bacteria have divided; these mutations are termed zero-point mutations. The much larger proportion of mutations occur during subsequent divisions. The mutation rate per bacterial generation is highest during the period when the bacteria are passing through the first few divisions after treatment; the rate then begins to decrease and reaches a normal level, i.e. a level accounted for by spontaneous mutation, when the bacteria have undergone approximately 13 divisions subsequent to treatment. The term end-point mutations is applied to the induced mutations detected at the point when the mutation rate attains a normal level.

The relation between zero-point and end-point mutation rates and dosage was determined for both radiations. The zero-point mutation rate increased very rapidly with increased dosage of ultra-violet light (wave length 2537 A), up to a maximum of 4000 ergs $\times$ mm.$^{-2}$, after which point the rate appeared to decrease slowly with increased dosage. The end-point mutation rate increased slowly with increased dosage. The survival curve of bacteria exposed to ultra-violet radiation is of a multiple-hit type. In the case of X-ray treatment the zero-point and end-point mutation rates were proportional to the dosage, the end-point rate increasing a little more rapidly than the zero-point rate. The survival curve for X-irradiation was of the one-hit type.

No evidence was obtained of any relationship between the ability of the radiation to produce sterilization and its ability to induce mutations, the mutation rate increasing with the dosage regardless of the killing effect of the radiation.

Similar results were obtained with resting and growing bacteria; and the results derived from limited experiments on line B, which is susceptible to radiation, were similar to those from investigations on B/r.

X-ray treatment is shown to be more effective than ultra-violet light in producing mutations and in its killing effect.

Various hypotheses on the possible mechanism of mutation to bacteriophage resistance are examined. It is thought that gene mutation is the most probable explanation.

Dienes, L. — *Complex reproductive processes in bacteria. (pp. 51–59).*

The following reproductive process has been observed in *Streptobacillus moniliformis*. The bacteria swell up into large round bodies which develop into either the usual bacterial colonies or into tiny colonies consisting of organisms with a morphology differing from that of the rest of the colony. The latter form, designated L, returns to the usual bacterial form under certain conditions. A similar although less complete reproductive process has been observed in other Gram-negative bacteria. In most of the bacteria studied only a few exceptional strains exhibited this process during a short period after isolation.

In *Proteus* it was found that when the spreading filaments of two cultures of appropriate strains come into contact, large bodies are produced from the filaments, which develop into the usual form of bacterial colonies or tiny colonies of the L type. The possible sexual nature of this process is discussed.

Dubos, R. J — *Variations in antigenic properties of bacteria.* (*pp. 60–66*).

A review is given of investigations on antigenic variation in the bacteria and its relationship with morphological variation.

Hershey, A. D. — *Spontaneous mutations in bacterial viruses.* (*pp. 67–77*).

The problems involved in the study of the heredity of viruses are discussed, and the terms mutation, genetic site, allele and genetic complex as used by the author with reference to the viruses are defined.

Two classes of intracellular spontaneous mutations occurring in the bacterial virus T2H, one affecting host range and the other affecting type of plaque, have been studied. The *r* mutation, characterized by a distinctive type of plaque and the capacity for rapid lysis as opposed to the lysis inhibition of the wild type of plaque, designated r^+, has been shown to be inherited independently of the mutation *h* affecting host range (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1113). The mutations h and h^c affecting host range are independent. Similarly, the mutations *s*, *w* and *r* from the corresponding wild types, affecting plaque type including lysis inhibition, were found to be determined by independent genetic sites. At each mutational site, the data suggest that there is a single structure subject to reversible alteration between only two alleles, the wild type allele and a mutant allele. No evidence was obtained in support of multiple allelism, coupled mutation, or mutation by loss. Evidence was obtained however for the transfer of genetic factors from one virus to another in mixed infections.

Hollaender, A. and Emmons, C. W. — *Induced mutations and speciation in fungi.* (*pp. 78–84*).

Conidia of *Trichophyton mentagrophytes* were exposed to 2537 Å and 2650 Å ultra-violet radiation. A high percentage (up to 40%) of the surviving conidia produced constant mutants which were strikingly different from the parental form. Some of the mutants closely resembled naturally occurring fungi generally recognized as distinct species; other mutants were of a type which would probably be assigned to new species were their origin unknown.

The authors have also investigated the effect of ultra-violet radiation upon other fungi, particularly *Aspergillus terreus* and *Penicillium notatum*, and obtained similar results to those observed in the experiments on *Trichophyton*.

The effect of wave lengths 2967 and 3130 Å was investigated in *A. terreus*; these wave lengths are of interest since they are present in the biologically effective part of the sunlight reaching the earth's surface, i.e. the range 2900 to 3150 Å. The two wave lengths tested produced mutation, but were less effective than the wave length 2650 Å, they gave mutation rates of 10% and less. Under laboratory conditions it has in general been impossible to obtain mutations as a result of treating spores of *A. terreus* with wave lengths longer than 3150 Å.

In preliminary experiments it has been found that unobstructed sunlight on a June day in Washington is able to produce a mutation rate of up to 6% in spores of *A. terreus*. It is suggested that the mutation rate of fungus spores exposed to sunlight is lower than the mutation rate of spores exposed to 2967 or 3130 Å ultra-violet radiation, possibly because the presence of the longer lethal wave lengths in sunlight, i.e. wave lengths exceeding 3500 Å, has an adverse effect upon the survival of many of the mutated spores.

Johnson, T. — *Variation and the inheritance of certain characters in rust fungi.* (*pp. 85–93*).

Investigations by the author and other workers on the inheritance of the pathogenicity of physiological races and of other characters in the rust fungi are reviewed. The life cycle of

Puccinia graminis and other fungi, and experimental methods of selfing and crossing are described; and the results of selfing physiological races, giving information on homozygosity and heterozygosity, and dominance and recessiveness for pathogenic characters, are summarized. The data from intravarietal hybrids of physiological races of *P. graminis* and other rust fungi have shown that inheritance of pathogenicity is according to Mendelian laws. Experiments on inter-racial crosses in both *P. graminis* var. *Tritici* and *P. graminis* var. *Avenae*, however, have provided some evidence of cytoplasmic inheritance of pathogenic properties. The uredospore colour in *P. graminis* has been found to depend upon two pairs of colour factors in a regular Mendelian manner. Intervarietal hybrids of *P. graminis* have been found to possess a wider host range than either parent, but this widening of the host range is accomplished at the expense of pathogenic vigour; considerable intersterility also exists between different varieties; the identity of existing varieties is thus maintained. Various abnormalities occurring in inbred material and mutations affecting pathogenicity and uredospore colour have been reported; other possible causes of phenotypic variation such as chromosome aberration, are briefly discussed.

Kidd, J. G. — *Distinctive constituents of tumor cells and their possible relations to the phenomena of autonomy, anaplasia, and cancer causation.* (*pp. 94–112*).

An interesting survey is given of morphological, biochemical and serological investigations which have bearing upon the problem of cancer causation. A comprehensive bibliography of 111 references is appended.

The possibility that the autonomy of cancer cells is wholly or partly due to the development within them of distinctive cytoplasmic constituents is examined with reference to various types of such constituents.

Lederberg, J. and Tatum, E. L. — *Novel genotypes in mixed cultures of biochemical mutants of bacteria.* (*pp. 113–14*).

Mixed cultures of multiple biochemical mutants of *Escherichia coli* have been found to give rise to nutritionally wild-type cells or prototrophs, which are stable. Additional experiments and an interpretation of the data on prototrophs have been reported elsewhere by the authors (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 11); in this other paper the suggestion is made that combination of characters occurred through sexual fusion.

Lindegren, C. C. and Lindegren, G. — *The cytogene theory.* (*pp. 115–29*).

In one pedigree of *Saccharomyces* involving differences in the ability to ferment galactose and in mating type, the ability to ferment galactose was transmitted on the basis of the inheritance of a single gene in a regular Mendelian manner. In a second pedigree involving differences in the ability to ferment galactose and melibiose and in mating type, the factors controlling the capacity to ferment these two substances were inherited in a regular Mendelian manner in most asci. It was however found that in this pedigree, some of the recessive non-fermenting progeny expected from the ascospores were fermenters. These "masked" recessives acquired the factors controlling fermentation in the absence of the substrates galactose and melibiose, apparently during meiosis, and generally retained their fermentative ability in the absence of the substrates. The masked recessives usually lost the capacity to ferment these substrates when mated to true dominants, but usually retained it when mated to true recessives.

As a result of these observations, it is suggested that the chromogene does not depend entirely upon synthesis in the cytoplasm for its supply of appropriate cytogenes, as previously postulated (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1622), but that synthesis of the cytogenes also occurs on the chromogene.

The results of investigations by the authors and other workers on the cytology of yeast are examined, with a view to interpreting the relationship between the cytogene and nucleoproteins.

The nuclear vacuole of the yeast cell contains an abundance of volutin together with a small amount of desoxyribose nucleoprotein. Desoxyribose nucleoprotein is also found in the

centriole, but the rest of the cytoplasm is invariably negative in tests for this substance. The cytoplasm contains ribose nucleoprotein granules coated with lipoids, when the cell is in a dormant condition. In the growing cell, the ribose nucleoprotein becomes dispersed in the cytoplasm and the granules disappear. According to the authors' view, the granules of the cytoplasm are equivalent to the nucleolus of higher organisms, and the cytoplasmic ribose nucleoproteins probably originate from the desoxyribose nucleoproteins of the centriole, the latter body possibly being the equivalent in yeast of the heterochromatin in higher organisms.

The following hypothesis on the relationship of the cytogene to the chromosomes and to the cytoplasmic ribose nucleoproteins is put forward. In the absence of substrate, the specific desoxyribose nucleoproteins, or chromogenes, are able to confer the capacity upon specific cytogenes of multiplying as prosthetic groups on the chromosome. When present in the cytoplasm, the cytogenes multiply as prosthetic groups attached to ribose nucleoproteins but only in the presence of substrate. The cytogene-ribose nucleoprotein complex is the precursor of the specific enzyme. The cytogene-ribose nucleoprotein complex is regarded as the equivalent of the plasmagene postulated by Spiegelman (cf. Abst. below).

In the discussion following the paper the contradictory views of C. C. Lindegren and O. Winge on mating types and heterothallism in yeasts are examined; and C. C. Lindegren replies to T. M. Sonneborn's criticism that the experimental foundation of the suggested cytogene theory is inadequate.

Luria, S. E. — *Spontaneous bacterial mutations to resistance to antibacterial agents.* (*pp. 130–38*).

A discussion is given of recent investigations by the author and other workers on spontaneous bacterial mutants showing resistance to bacteriophages, drugs, antibiotics and radiation. The mutations described suggest analogies with the gene mutations of higher organisms.

The technique of identifying these mutations as spontaneous and of determining mutation rates is examined (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 486); and consideration is given to independent mutations to bacteriophage resistance, mutations with multiple phage resistance, and resistance to increasing concentrations of antibacterial agents built up step-wise by accumulation of successive mutations.

Lwoff, A. — *Some problems connected with spontaneous biochemical mutations in bacteria.* (*pp. 139–55*).

Spontaneous biochemical mutations in the bacteria studied by the author and his colleagues at the Pasteur Institute are reported.

Two main types of mutation are described: (1) so called anaphragmic mutation involving a change in the metabolism of ternary compounds and essentially a "suppression of an inhibition", and (2) mutation involving a change in the capacity to synthesize essential metabolites.

Two types of the former are distinguished. (*a*) The specific metabolic activity of the original bacteria brings about the inhibition of the enzyme concerned with the oxidation of the specific substrate forming the source of carbon and energy; the mutation allows the specific substrate to be "normally" utilized. Examples of such mutations are the S^- form of *Moraxella lwoffii* which can utilize succinic, fumaric, *l*-malic and oxaloacetic acids, and the G^+ form of *Escherichia coli* which can utilize galactose. (*b*) The mutation may suppress the attack on the specific substrate and thus the production of substances inhibiting some important growth reaction not necessarily related to the specific substrate. Examples of this type include the rhamnose mutant of *Eberthella typhi*, and the xylose-mutant of *"Salmonella dublin"*.

The data on these and similar mutations in enzymatic properties indicate that they each involve a specific enzyme or precursor. The possible mechanism of enzymatic adaptation is discussed, with reference to the hypothesis of J. Monod. According to this hypothesis, enzymes allowing utilization of carbohydrates by bacteria are all derived from a common precursor. This precursor has a slight general affinity for carbohydrates; transformation of the precursor into an adapted specific enzyme occurs as the result of the substrate-precursor combination. Certain substances might have greater affinity for the precursor

and thus be able to displace other substrates; this provides an explanation of the non-specificity of the inhibiting effect exerted by constitutive substrates. The hypothesis of a common precursor is supported by the interaction which has been found between the galactose positive and lactose positive mutations of *E. coli*. Furthermore, the behaviour of the S^+ mutation in *M. lwoffii* could be explained on the basis of a structural change involving a common precursor to four specific enzymes. The problem of whether the specific enzyme or its precursor is to be identified with the gene is examined, and methods of analysing this problem are suggested.

The mutations in growth requirements described are (1) a mutation in a coliform bacterium able to synthesize methionine, and mutations of *E. coli* involving changes in both proline synthesis and phage resistance; possible genetical explanations of the latter are discussed.

In conclusion, attention is drawn to the significance of the general tendency of loss in synthesizing ability shown by the bacteria to an understanding of their evolution. It is suggested that loss of certain functions may be of selective advantage, provided the medium supplies a sufficiency of ready made growth substances, since such a loss may result in the acceleration in the formation of other essential growth substances, i.e., in an increased growth rate.

MacDowell, E. C. *Variation in leukemic cells of mice.* (*pp. 156–76*).

Lines of leukemic cells in mice differ according to various criteria, such as rate of invading and penetrating host tissues, rate of cell division produced in the host, and killing time. The characters may be constant over a period of transfers in susceptible hosts, thus affording evidence of the genetic continuity of a given leukemic population, but all the various criteria are subject to variation. The paper reports persistent changes associated with leukemic cells in mice in the following features, which were observed in the course of serial transplantations of different lines; interval before the death of the host, observations obtained for autopsy, the frequency distributions shown by the diameters of the cell and metaphase plate of the host, basophilia, the rate of the cell division stimulated, rate of infiltration, host range as a result of changes in the leukemic cells, reaction to a specific gene of the host conditioning susceptibility, reaction to induced resistance, and reaction of the leukemic cells to heat treatment. The mechanism of the relationship between these phenomena and the structure of leukemic cells is at present unknown. In conclusion, it is stated that it would be premature at this stage to indulge in the speculation that is stimulated by the many similarities of these phenomena with the variations of micro-organisms.

McCarty, M., Taylor, H. E. and Avery, O. T. *Biochemical studies of environmental factors essential in transformation of pneumococcal types.* (*pp. 177–83*).

Transformation of a non-capsular variant known as R, derived from one specific type of *Pneumococcus*, into capsular cells of heterologous specific type, known as S, can be brought about by the following technique. The R cells are grown in a special serum broth to which has been added the active transforming fraction extracted from S cells. The production of a polysaccharide capsule is induced in the R cells so that they acquire the specific type of the organisms from which the extract was obtained. The property of forming the new capsule is transmitted indefinitely to subsequent generations, and, in addition, the substance responsible for inducing the transformation is itself reduplicated in the transformed cells. The transformation is thus a hereditary modification; and it has been established that the active transforming substance is a specific nucleic acid of the desoxyribose type.

Experiments reported in the present paper have led to the hypothesis that the chief role of the serum in the transformation is the alteration of the surface of the R cells, so that the specific desoxyribonucleic acid can be taken up. Three components of the serum appear to be involved in the transformation, viz., the R antibody, an additional protein constituent, and a dialyzable factor which may be combined with the protein constituent.

Pirie, N. W. *The state of viruses in the infected cell.* (*pp. 184–92*).

A survey is given of research on the state of viruses in the infected cell, under the headings: complexes with components of normal tissue, alterations of the virus during isolation, and

attachment of viruses to the cell structure. Among the tentative conclusions drawn is the following: the stability of the virus, and thus presumably the likelihood that it will undergo variation or mutation, is bound to depend upon the state of chemical composition in which the virus exists in the interval between its production and the establishment of infection in another cell.

Pontecorvo, G. *Genetic systems based on heterocaryosis.* (*pp. 193–201*).

Heterocaryotic genetical systems in the fungi are not based upon caryogamy and meiosis as in heterozygotic systems but on the segregation and recombination of whole nuclei in multinucleate cells. The particular genetical problems presented by heterocaryosis are considered and techniques for analysing these problems suggested, with reference to the following aspects: frequency of hyphal fusion; nuclear migration following hyphal fusion; multiplication and segregation of nuclei in heterocaryons; the combined control of nuclear ratios by the genetical properties of the nuclei and conditions external to the cell; the population genetics of heterocaryotic systems; and the possibility that a study of the genetics of heterocaryons may throw light upon bacterial variation.

Rhoades, M. M. *Plastid mutations.* (*pp. 202–07*).

Literature which has bearing upon the problem of plastid mutation is surveyed. Interpretations advanced to explain the maternally inherited type of variegation known as *status albomaculatus*, the variegation in *Pelargonium zonale* and other plants in which inheritance of the variegated character is non-Mendelian but biparental, and the plastid system of *Oenothera* species are discussed. Special reference is made to work by the author on gene-induced plastid mutation in maize (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 850). The evidence from the various investigations suggests that plasmagenes control plastid production as independent hereditary units, and possibly mutate independently of nuclear genes, or as in the case reported for maize as the result of genic action. The results so far obtained from investigations on the effect of X-rays and chemical treatment upon plastids are summarized; the need for further work on this subject is stressed.

Richards, O. W. *Biological phase microscopy.* (*pp. 208–14*).

A useful account is given of the phase microscope and its application in the study of microorganisms and other biological material.

Ryan, F. J. *Back-mutation and adaptation of nutritional mutants.* (*pp. 215–27*).

Investigations by several workers have shown that changes in the nutritional adjustment of *Neurospora* may be brought about either by genic mutation or by a non-inherited process. A detailed account is given of a mutant described as spontaneous and designated strain 33757–4637–A, requiring leucine for its growth in comparison with the wild type which can grow in the absence of leucine, and of the prototrophic back-mutation of the so-called leucine-less factor l_1 to the wild-type factor L. The frequency of back-mutation depends upon the temperature and leucine concentration. It was found that in a heterocaryon selection occurs between nuclei carrying the l_1 factor and nuclei carrying L. In the presence of leucine, the nuclei with the l_1 locus have a selective advantage over nuclei with the L locus. The larger the number of nuclei with the l_1 factor the less growth the prototrophic component can undergo; this relation holds until the growth produced by a heterocaryon is almost completely composed of the leucine-dependent component, as appears to be the case in the presence of large amounts of leucine. The results further suggest that the mass of mycelium affects the frequency of back-mutation; the larger the mass of leucine-dependent mycelium the less is the chance that a back-mutated nucleus will escape from the competitive influence of the nuclei carrying l_1 and form a leucine-independent growth. Heterocaryons of another leucine-less strain carrying l_1, a leucine-less mutant with a gene designated l^1, and a double leucine-less mutant have also exhibited a selective process similar to that observed in heterocaryons of strain 33757–4637–A.

Spontaneous back-mutations of uracil-independent mutants of the bacterium *Clostridium septicum* to the original condition of uracil dependence are described (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 616).
X-ray induced biochemical mutants of *Escherichia coli* resembling those induced in *Neurospora* have also been studied; in preliminary experiments these mutants of *E. coli* have back-mutated in a manner similar to that reported in *Neurospora*.

Shapiro, A. — *The kinetics of growth and mutation in bacteria.* (*pp. 228–35*).

An analysis of the processes of multiplication and mutation in exponentially growing cultures of bacteria has led to the assumptions of constant growth and mutation rates for any particular culture under specified conditions. Methods of calculating the values of the constants of the specific growth and mutation rates for a particular culture are given.
In the discussion subsequent to the paper, S. Zamenhof raises the point that before mathematical calculation of the mutation rate of micro-organisms is possible it is necessary to have a correct definition of mutation rate. The latter aim requires the solution of the problem of whether mutations in micro-organisms are possible without cell divisions.

Sonneborn, T. M. — *Experimental control of the concentration of cytoplasmic genetic factors in Paramecium.* (*pp. 236–55*).

Information obtained by the author on the inheritance of the pair of alternative characters in varieties 2 and 4 of *P aurelia*, designated killer and sensitive, is summarized. The killer phenotype is manifested only in the presence of the cytoplasmic factor known as κ and the dominant gene K. Sensitive organisms possess either gene K or k, and no κ or only a low concentration of κ particles.
Experiments of Preer (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 573) with variety 2 and by the author with variety 4 have shown that (1) κ is distributed at random during fission, and (2) reduction of fission rate due to inadequate food, autogamy and old age provides the necessary mechanism for the transformation of sensitives containing a low concentration of κ particles into killers since it enables κ to increase more rapidly than the animals, thereby bringing about a net increase in the concentration of κ.
Preliminary experiments by the author are reported which have demonstrated that the concentration of κ may also be controlled by temperature. A quantitative relation between length of exposure to 38·5° C. and the amount of κ destroyed has been found. Further experiments are in progress to construct a heat-inactivation curve; the bearing of this technique upon a number of important problems is indicated. The experiments also led to the observation of an intermediate condition between killer and sensitive, termed resistant non-killer. Thus a series of characters depending upon κ concentration appears to exist, ranging from pure sensitives without any κ, sensitives with very few κ particles which can produce some chance progeny without any κ as a result of fission but which can produce killers when the fission rate is reduced, sensitives with a slightly higher concentration of κ which cannot give rise to any κ-less progeny in fission, resistant non-killers which have lost sensitivity, and normal killers.
The discussion by the author draws attention to the fact that rate of increase of κ and rate of reproduction of the organisms and of their genes do not necessarily agree. It also examines the significance of the low concentration of κ normally present in explaining the recombination of cytoplasmic factors analogous to the recombination of genes which has been reported by the author; the problem whether the particle of κ consists of a single molecule or group of molecules; and the bearing of the results obtained by the author upon a possible interpretation of the dauermodifikations described by Jollos, certain problems of developmental differentiation in higher organisms, aging and the life cycle of Protozoa, the genetics of micro-organisms, and the bipartite structure of the gene previously advanced by the author (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 1320, and Vol. XVI, Abst.139).
Caution is advocated in regarding heritable variations in micro-organisms as gene mutations similar to those of higher organisms, in view of the results of work of *P. aurelia* in which the change from killer to sensitive or the reverse can take place in the absence of

mutation of the gene or cytoplasmic factor, and in which changes in the concentration of the cytoplasmic factor and the corresponding phenotypic changes may persist for many cell generations.

In view of the disparity between the rate of increase in κ and the rate of increase of the genes, the author's hypothesis that κ is united with a macronuclear gene is no longer tenable. It is however pointed out that in one group of varieties inheritance appears to be entirely genic, whereas in another inheritance appears to be both genic and cytoplasmic; this fact still suggests that the origin of cytoplasmic factors in *Paramecium* is to be traced ultimately to the nuclear genes.

In the discussion subsequent to the paper S. Spiegelman modifies his plasmagene theory (cf. Abst. below) to provide a possible explanation of the mode of action of κ, and the origin of κ from gene *K*. Among the remaining points raised is the possibility of whether κ is a virus.

Spiegelman, S. *Nuclear and cytoplasmic factors controlling enzymatic constitution.* (*pp. 256–77*).

The results of experiments by the author and other workers on the inheritance of adaptive enzymes in the yeasts and on the mechanism of enzyme formation are summarized and interpreted. The following hypothesis is put forward. The gene has the primary function of the indefinite retention by the cell of the potentiality to form enzyme. Certain recessive genes, e.g., the gene controlling the inability of *Saccharomyces cerevisiae* to produce melibiase, are unable to perform this function. The actual formation of an enzyme in the cytoplasm is directly effected by a cytoplasmic unit or plasmagene which possesses the capacity for self-duplication in the presence or absence of the corresponding gene. It is suggested that the genes concerned in enzymatic activity continually produce at different rates more or less complete replicas of themselves, which enter the cytoplasm, constituting the plasmagenes. Nucleoproteins are involved in the synthesis of enzymes, and the self-duplicating plasmagenes are provisionally identified with these nucleoproteins, instead of with the enzymes as has been suggested by C. C. Lindegren (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1622), who uses the term cytogene to denote the cytoplasmic unit. The plasmagenes compete with each other for protein and energy, the outcome of such competitive interactions determining the enzymatic constitution of the cytoplasm. The presence of substrates greatly intensifies the capacity of the plasmagenes to produce enzyme. The possible mechanism of the reaction of the self-duplicating plasmagenes in the absence and presence of substrate is outlined. In the absence of substrate, the heterocatalytic plasmagene duplicates itself if suitable material is available in the cytoplasm, or it may combine with precursor protein and convert it to an enzyme E_1, to form the resulting complex Pl_1E_1, Pl_1 being used to symbolize the plasmagene. In the absence of substrate the Pl_1E_1 complex breaks down into inactive protein. When substrate S_1 is added, however, the substrate will combine with E_1 which is already in combination with Pl_1, to form the complex $Pl_1E_1S_1$, which then undergoes duplication. Thus the substrate can modify competitive interactions between plasmagenes, and accomplish the production of a new self-duplicating unit, duplicating not only the plasmagene but also the enzyme corresponding to the substrate added.

On the basis of this hypothesis it can be expected that cells not possessing the initiating gene for the synthesis of a given enzyme could still retain the capacity for the synthesis of the enzyme, provided an adequate number of appropriate nucleoprotein units were present in the cytoplasm. It is noted that some evidence has been obtained from experiments on the production of melibiase and galactozymase that cytoplasmic transmission of the capacity to form enzyme occurs in the absence of the genes concerned in enzyme synthesis. The suggested theory also explains the different modes of inheritance of enzyme production observed. According to this theory, whether the character of the capacity to form a particular enzyme will be transmitted from one cell generation to another in a Mendelian fashion or not will depend on the rates of duplication of the controlling cytoplasmic units as compared with their rate of production from the genome. If the latter is predominant, Mendelian inheritance will be observed; if the former is predominant, Mendelian inheritance will be obscured.

In the discussion of the paper, S. Zamenhof and S. S. Cohen critically examine the chemical nature of the "nucleoprotein fraction" prepared by the author from adapted cells, the active component of which stimulated the formation of the same enzyme in unadapted cells as that found in the cells used for the preparation of the extract; J. Monod gives information on chemical and genetical aspects of enzymatic adaptation in the bacteria; and J. M. Reiner adds experimental observations on chemical reactions involved in the adaptation of yeast.

Tatum, E. L. *Induced biochemical mutations in bacteria.* (*pp. 278–84*).

Investigations on biochemical mutants of bacteria induced by X-rays, ultra-violet radiation and by chemical treatment are critically examined. The heritable biochemical deficiencies induced by these methods are, it is concluded, biochemically analogous to those associated in *Neurospora* with single gene mutations. In the author's view, it therefore seems probable that the bacteria possess genes, or at least some entities analogous to genes in their function and mode of reproduction.

Niel, C. B. van *The classification and natural relationships of bacteria.* (*pp. 285–301*).

The systems of classification of the bacteria put forward by Cohn in 1872, and later by Migula, Orla-Jensen, Buchanan, and Bergey are evaluated. The author points to the confusion in bacterial classification that has been brought about by the general tendency to regard a system of classification based upon the single criterion of morphological or physiological properties as a classification of phylogenetic value. A more flexible system representing a method of identification and not a taxonomic classification is suggested as a more efficient method of classifying the bacteria, consisting of a number of keys each based upon a primary set of characters, such as morphological, physiological, biochemical and pathogenic characters. The problems of nomenclature entailed in the proposed system of multiple keys are discussed. It is suggested that discontinuance of the terms species and genus would eliminate some of the difficulties offered by bacterial characters.

1459. Braun, W. 632.3:575.24:575.41
575.247:575.41

Studies on bacterial variation and its relation to some general biological problems.

Amer. Nat. 1947 : **81** : 262–75.

Dissociation, i.e. the appearance of mutations involving the form of the bacterial colony, antigenicity and other characteristics, was studied in *Brucella abortus*. It was found that the percentage of dissociation was different for strains from different sources cultured in a standardized environment, and was, in fact, determined by inherent factors characteristic of different cell progenies. The dissociation percentages were, however, modified by environmental conditions altering population dynamics including daily transfer of cultures, differences in nutrients, temperature and *p*H, and reduced oxidation-reduction potentials. While the absolute degrees of association were altered under such conditions, the relative differences between clones were retained. An investigation of the relationship between dissociation and population dynamics showed that the factors which control the dissociation index do so by determining the growth rate and viability of the clone, and thus the point at which population pressure acting as selection pressure begins to operate.

The apparent instability of bacterial mutants, the apparently specific adaptation of bacteria to their natural environment and their apparent ability to adapt themselves to new environments are explained in terms of selection pressure acting on organisms undergoing rapid asexual reproduction. It is concluded that there is no reason to assume that changes in characteristics of bacteria differ fundamentally from mutations in higher plants and animals. The occurrence of apparently successive mutations observed in bacteria and fungi under laboratory conditions and of reversions are similarly explained. The author's recent work on selective environments provides further support for the theory developed here.

It is shown how the results obtained for *B. abortus* are consistent with certain general evolutionary concepts. Morphogenesis is discussed, with particular reference to the problem of cancer, in the light of the observations on bacterial variation and of evidence concerning quantitative control of somatic mutations in maize.

1460. Stapleton, G. E., Loftus, E. and Armstrong, I. 632.3:575.243:539.165:578.08
Techniques for irradiating micro-organisms with artificially radioactive materials. Part I. Radioactive material in suspension.
Amer. J. Bot. 1947 : **34** : p. 596. (Abst.)

New methods of handling radio-active material have been devised for treating micro-organisms.

1461. Anderson, E. H., Stapleton, G. E. and Newton, A. C. 632.3:575.243:539.165:578.08
Techniques for irradiating micro-organisms with artificially radioactive materials. Part II. External radiation sources.
Amer. J. Bot. 1947 : **34** : p. 593. (Abst.)

The invention of special irradiation chambers permitting the exposure of large numbers of micro-organisms to high intensities of β-irradiation is reported.

1462. Ark, P. A. 632.3:575.243:581.04
Mutation in certain phytopathogenic bacteria induced by acenaphthene.
J. Bact. 1946 : **51** : 699–701.

The literature on the effect of colchicine on bacteria is briefly reviewed. Acenaphthene has been found to cause permanent mutations in *Phytomonas michiganensis* and *Erwinia carotovora*. One type of mutant of the former species was more virulent than the parent culture; another was not pathogenic to tomato plants. A mutant of *E. carotovora* only slightly pathogenic on carrot slabs was obtained. Prolonged growth in acenapthene broth did not induce mutation in *Ph. phaseoli*. Thus acenaphthene does not affect all species of bacteria in the same way.

1463. Paine, T. F. and Finland, M. 632.3:575.243:581.04
Streptomycin-sensitive,—dependent and—resistant bacteria.
Science 1948, **107** : 143–44.

Two kinds of variants have been derived in very small proportions from streptomycin sensitive strains of *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa* and *Proteus morgani* by exposure of these organisms to high concentrations of streptomycin. The two kinds are referred to as resistant, i.e., able to grow either in high concentrations of streptomycin or in its absence, and dependent, i.e., able to grow only in the presence of streptomycin. The critical concentrations above which sensitive strains did not grow and below which dependent variants failed to grow were approximately equal. The resistant variants but not the dependent ones bred true.

1464. Palmer, J. L. 632.3:576.35
Nuclear staining of *Escherichia coli*.
J. Bact. 1946 : **51** : p. 586.

Nuclear differentiation of *E. coli* is reported to begin soon after transfer to a fresh medium while cell elongation without division is taking place. The nuclei of actively growing cells appear to divide before the cell itself does so, with the result that two nuclei are present in the longer cells.

1465. Pontecorvo, G. 632.4:575.1
La genetica dei microorganismi. **(Genetics of microorganisms).**
Ital. Agric. 1947 : **84** : 11–14.

The knowledge of fungus genetics acquired in recent years is being applied in improving

the strains of yeast employed in the fermentation industries. An outline is given of the main results of the studies of the mutants in *Neurospora* and *Penicillium* affecting the synthetic activity of the fungus, showing that the different types correspond to an interruption of the synthetic process at a different point in the chain and that each is conditioned by a different gene, which would seem to be strong evidence that each gene determines the specificity of an enzyme. These mutants have provided a means of estimating various vitamins, amino-acids and other substances quantitatively. Their use for the industrial production of certain substances is illustrated by reference to a *Penicillium notatum* mutant with much higher penicillin production and a mutant of *Aspergillus terreus* with an increased production of itaconic acid used in plastics. The role of heterocaryosis in heredity in the fungi is mentioned and the article ends with a brief reference to cases in the bacteria and viruses where by mixing two mutants together, new forms with properties different from either have been obtained.

1466. REYNOLDS, E. S. 632.421.2:575.061.6
Sectorial segregation in *Aspergillus* cultures.
Amer. J. Bot. 1947 : **34** : p. 595. (Abst.)

Three new cases of colour segregation occurring in the *A. flavus* and *A. versicolor* groups, respectively, are reported.

1467. BONNER, D. 632.421.9:575.24:581.192
The identification of a natural precursor of nicotinic acid.
Proc. Nat. Acad. Sci. Wash. 1948 : **34** : 5–9.

Genetical investigation of *Neurospora crassa* mutants requiring nicotinic acid, nicotinamide or related compounds for growth has revealed at least three genetic types. Some results of tests of strains for accumulation of substances intermediate in the synthesis of nicotinic acid are briefly indicated.

It is concluded from an investigation reported here that tri-hydroxy-anthranilic acid isolated from *Neurospora* filtrates is a natural precursor of nicotinic acid.

1468. RAPER, K. B. and
FENNEL, D. I. 632.421.2:575.243:535.61–31
The production of penicillin X in submerged cultures.
J. Bact. 1946 : **51** : 761–77.

A substrain designated NRRL 19 appeared, presumably by induced mutation, in a culture of *Penicillium chrysogenum* 1948 A irradiated by ultra-violet light. It gave substantially higher yields of penicillin X than were produced by the parent culture.

1469. 632.421.9:575.24:581.192
EMERSON, S. 632.421.9:575.125
A physiological basis for some suppressor mutations and possibly for one gene heterosis.
Proc. Nat. Acad. Sci. Wash. 1948 : **34** : 72–74.

It has been found that apparent reversions of a *Neurospora* strain requiring sulphonamides for growth at 35° C. to a type in which growth is possible at that temperature without sulphonamides, resulted from mutations of genes distinct from that responsible for sulphonamide requirement. These "suppressor" genes were present only in some of the nuclei of the "reverted" strains.

It follows from the results of recent investigations that any mutation which reduced the available *p*-aminobenzoic acid content might permit growth of the sulphonamide-requiring strain in the absence of sulphonamides even if the mutant gene were present in only part of the nuclei in a heterocaryon.

To test this possibility, artificial heterocaryons were made between a strain carrying the gene *sfo* for sulphonamide requirement and the gene *pab* which prevents *p*-aminobenzoic acid synthesis on the one hand, and a strain carrying *sfo* and +, the wild type allelomorph of *pab*, on the other. Although both the component strains were sulphonamide-requiring, the heterocaryons between them were not so. The growth results from a balance between the production of *p*-aminobenzoic acid by one type of nucleus and the lack of production by the other to give an amount sufficient for growth but tolerated by strains carrying *sfo*. The augmented growth of the heterocaryon is comparable to single gene heterosis in maize.

1470. Mitchell, H. K. and
Nye, J. F. 632.421.9:575.24:581.192
Hydroxyanthranilic acid as a precursor of nicotinic acid in *Neurospora.*
Proc. Nat. Acad. Sci. Wash. 1948 : **34** : 1–5.

The growth promoting activity of hydroxyanthranilic acid and five other substances on five different *Neurospora* mutants was compared. Hydroxyanthranilic acid is shown to be an intermediate substance in the biosynthesis of nicotinic acid in *Neurospora*.

1471. Zalokar, M. 632.421.9:575.24:581.192
The *p*-aminobenzoic acid requirement of the "sulphonamide-requiring" mutant strain of *Neurospora.*
Proc. Nat. Acad. Sci. Wash. 1948 : **34** : 32–36.

A study is reported of the growth response to folic acid and related compounds of *Neurospora* strains carrying mutant genes for *p*-aminobenzoic acid requirement, for sulphonamide requirement, and for both these characters respectively.

1472. Fries, N. 632.421.9:575.242:575.42
Spontaneous physiological mutations in *Ophiostoma.*
Hereditas, Lund 1948 : **34** : 338–50.

Some conidial suspensions of the fungus *O. multiannulatum* were grown in normal media and others kept in media lacking one constituent necessary for growth. They were then germinated on a complete agar medium and the mycelia grouped by means of an isolation technique according to certain significant physiological properties. In this way 13 types of mutants were identified. The percentages of mutants obtained from the normal and deficient cultures respectively were 0·03%, and 0·25% or possibly 0·41%. The distribution of the mutants among the different experiments, however, showed that most of the mutations could not have been induced by the deficient media, but there was evidence to support the assumption that selection of spontaneous mutations occurred in these media.

1473. Miller, H. and
McElroy, D. 632.421.9:575.243:581.04:578.08
Factors influencing the mutation rate in *Neurospora.*
Science 1948 : **107** : 193–94.

Data are presented on the effect of bis-β-chloroethylmethylamine on the mutation rate of *Neurospora* at different stages of its life cycle. The results support the hypothesis that cells containing actively growing or dividing nuclei are more susceptible to the action of mutagenic agents. They also show the necessity of controlling the age and degree of hydration of conidia in work involving the inducing of mutations by chemical agents.

1474. 632.421.9:575.246:535.61–31
Giles, N. H. (jun.) and 632.421.9:575.246:537.531
Lederberg, E. Z. 632.421.9:575.246:581.04:539.16
Induced reversions of biochemical mutants in *Neurospora crassa.*
Amer. J. Bot. 1948 : **35** : 150–57.

An investigation is reported of the phenomenon of adaptation of *N. crassa* mutants to a medium lacking the substance originally required. In some mutants, the rate of adaptation was greatly increased by ultra-violet radiation. Genetical and physiological evidence was obtained that adaptation of the inositol requiring strain was brought about by a reverse mutation giving rise to wild type nuclei. Such reverse mutations were shown to occur spontaneously and to become more frequent with increasing concentration of inositol, and thus with increasing numbers of nuclei, carrying the gene for inositol requirement which suggests that in these conditions there is no selection against the reverse mutations. X-rays, radioactive phosphorus and nitrogen mustard were effective in inducing reversions in the inositol-requiring strain. Ultra-violet radiation and other treatments failed to bring about adaptation of the pantothenic acid requiring strain. The response of the riboflavin requiring strain resembled that of the inositol requiring strain, and one ultra-violet induced adaptation was found to be a reverse mutation. Results obtained with the tryptophane requiring mutant suggest that spontaneous adaptations and some of those induced by ultra-violet treatment are non-genetic. The rates of adaptation in a choline requiring

mutant and in a methionine requiring mutant were considerably increased by ultra-violet irradiation.

1475. Olson, E. O. 632.421.9:581.162:575
Studies on genetics of *Ceratostomella fimbriata.*
Phytopathology 1948 : **38** : p. 20. (Abst.)
The reproductive behaviour of two strains of *C. fimbriata*, viz. the typical long-necked perithecial strain and a non-perithecial strain producing small sclerotium-like bodies, is described.

1476. Wheeler, H. E. and
Chilton, S. J. P. 632.421.9:581.162:575.113.3
Multiple alleles and factor interaction in *Glomerella.*
Phytopathology 1948 : **38** : p. 28. (Abst.)
Single ascospores from plus cultures of *Glomerella* invariably produced a high percentage of variants of the minus type. Other types of variants were produced less frequently. Analyses of asci produced from crosses between 18 strains differing in cultural and morphological characters and isolated from a plus-type culture showed that characters in seven of these strains were controlled by six genetic factors or groups of factors. Three of these factors were at one locus, designated A, and three were at a second locus B on the same chromosome. The factors at each of these loci were apparently multiple alleles. Two pairs of allelomorphs, one at each of the two loci, determined the production of fertile perithecia. A factor for partial self-sterility at locus B was epistatic to a factor for self-fertility at locus A when the two were present in a minus strain; the reverse was true if the same two factors were present in a plus strain.

1477. Lindegren, C. C. 632.422.3:575
Yeast genetics; life cycles, cytology, hybridization, vitamin synthesis and adaptive enzymes.
Amer. Brewer 1946 : **79** : No. 12 : 21–26, 38, 40, 44.
Genetical and other evidence to justify the application of the terms haplophase and diplophase to yeasts in the absence of complete cytological proof is summarized.
An explanation is given of the inheritance of mating type and of the combination of *a* and α types grown together in broth to produce diploid cells. When the diploid cells produce spores, meiosis occurs and segregation takes place with respect to those genes for which they are heterozygous. Thus the haploid colonies which grow from the ascospores vary. Mutations find expression in the haploids since there are no allelomorphs to counteract the effects of mutant genes. Examples are given of mutations which may occur. The genetic mechanism for producing variation in yeasts consists of segregation, mutation and recombination. A diagrammatic representation of the process is presented.
The advantage of alternating haplophase and diplophase generations in producing variation in yeast is discussed. A fairly long haplophase causes the different mutants to compete with each other and only the most vigorous of them form spores. Under natural conditions the improvement of yeasts has been brought about by natural selection of diploids or haploids. Repeated artificial selection of haploids may result in sterility so that intensive selection and hybridization become mutually exclusive.
The mechanism of natural selection in a culture in which the population density is increasing is considered.
When a haplophase culture acquires the ability to ferment some particular carbohydrate a specific mutation must occur and the mutant must become adapted to the carbohydrate. The exposure time for the cytoplasmic adaptation of a haploid mutant to the fermentation of galactose was found to vary from a few hours to several days.
In the diplophase, mutations are suppressed and adaptations occur only through the cytoplasmic mechanism. Haploids however are very variable and are therefore chosen for the selection of variants.
As a safeguard against undesirable mutations in haplophase cells isolated for industrial purposes, a minimum of nutrients should be supplied so that competition is initiated almost immediately and only desirable forms will be able to multiply. Each time the cells are

transferred to a new medium the volume of the latter should bear such a relation to the number of cells that competition is maintained.
Asci may produce one, two, three or four ascospores. It has been found that spores from the single-spored asci of illegitimate cultures produce diploid cells directly when sub-cultured, which would seem to indicate that meiosis had not taken place prior to spore formation.
In the opinion of some authorities, *Torulopsis*, *Zygosaccharomyces* and probably other genera were derived from *Saccharomyces*. The mechanism of speciation is discussed.
Observations on the cytology of the yeast cell are summarized.
Adaptation in yeast is brought about by the production of variants by two different mechanisms, genetical and cytoplasmic.
Mutations may be either spontaneous or induced by contact with the substrate.
An account is given of the pedigree obtained by Lindegren, Spiegelman and Lindegren on the basis of a series of matings between *S. cerevisiae* and *S. carlsbergensis*. It shows the inheritance of the ability to produce the enzyme melibiase.
A glossary is appended.

1478. Subramaniam, M. K. and
Ranganathan, B. 632.422.3:575.243:581.036.5
Induction of mutations in yeast by low temperatures.
Sci. and Cult. 1947 : **13** : 102–05.

Four different yeast strains obtained by cold treatment from the brewery strain (Sc.,9, N.C.T.C., 3, 007) cultured on wort are described. In size and shape the cells resembled mutants obtained by acenaphthene treatment by Subramaniam and Ranganathan (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 517). Those of one colony showed almost complete reversion. Three mutations were involved; they gave rise to large, bottom-fermenting cells, oval to long top-fermenting cells and small round to oval top-fermenting ones, respectively.
The similarity between the cold-induced and acenaphthene-induced mutations suggests that these mutations occur in nature and the process is merely accelerated by the agents employed.

1479. 632.422.3:576.353
Subramaniam, M. K. 632.422.3:576.312.32:581.192
Studies on the cytology of yeasts. 1. Mitosis in *Saccharomyces cerevisiae*.
Proc. Nat. Inst. Sci. India 1946 : **12** : 143–49.

A technique for the cytological study of yeast is described. It has been found that in rapidly growing cultures in wort the mitotic stages are not obscured by volutin granules in the final preparations. The resting cells of *S. cerevisiae* were observed to be free from stained granules in both the cytoplasm and nucleus. As the cell became active, chromatin granules were seen in the nucleus, apparently radiating towards the periphery. A central chromatin granule then developed and gradually occupied the whole nucleus; this central granule divided into two chromosomes. In the next mitotic stage the chromosomes split longitudinally and separated in pairs. It was found that a bud may begin to develop during anaphase or it may appear only after the reconstitution of the two nuclei. Telophasic reconstitution and the migration of one nucleus into the daughter cell show some interesting variations. One pair of chromosomes may migrate to the bud while the components of the other pair also retain their individuality; the mother cell may have a reconstituted nucleus and the daughter cell separate chromosomes; or one of the two reconstituted nuclei may be seen passing to the bud while the other remains in the mother cell.
An appended note critically examines the suggestion recently put forward by K. V. Srinath that yeasts possess Feulgen positive centrioles and Feulgen negative chromosomes (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1035.)

1480. Prema Bai, M. and
Subramaniam, M. K. 632.422.3:576.356.5
Rate of growth of diploid and tetraploid yeasts.
Curr. Sci. 1947 : **16** : 380–81.

Spontaneous tetraploids of yeast were observed as smooth sectors in giant colonies of a

diploid strain. The tetraploid form was found to possess a more rapid growth rate than the diploid.

1481. MITRA, K. K. 632.422.3:581.04:576.356.5
Autotetraploidy and attenuating power in yeasts.
Curr. Sci. 1948 : **17** : p. 55.

A previous experiment on a tetraploid strain of yeast induced by acenaphthene treatment showed that the tetraploid form possesses an increased rate of growth in comparison with the diploid (cf. Abst. 1480). The present communication reports that doubling of the chromosome complement also results in an increased rate of attenuation.

1482. FISCHER, G. W. 632.451.2:575.127.2:576.16:633.2
Hybridization between *Ustilago hordei* and *U. bullata*.
Phytopathology 1948 : **38** : p. 9. (Abst.)

Investigations on hybrids between *U. Hordei* from *Elymus canadensis* and four races of *U. bullata* are reported. When *U. bullata* from *Bromus tectorum*, possessing verrucose spores with uniformly coloured walls, was crossed with *U. Hordei*, possessing smooth spores with the walls lighter coloured on one side, the F_1 and F_2 spores were echinulate and distinctly lighter coloured on two sides. When *U. bullata* from *B. purgans*, having large verrucose spores with uniformly coloured wall, was crossed with *U. Hordei*, having smaller, smooth spores with the wall a lighter colour on one side, the F_1 spores were small, minutely echinulate, and showed a tendency to be lighter coloured on two sides. The F_2 generation segregated into the following spore types: small, echinulate, with a tendency to be lighter coloured and more strongly echinulate on one side; small, smooth, lighter coloured on both sides; large, punctate, with uniformly coloured wall; and large, echinulate, and lighter coloured and more strongly echinulate on one side.

1483. FISCHER, G. W. 632.451.2:575.127.2:576.16:633.2
Hybridization between *Ustilago striiformis* and *U. bullata*.
Phytopathology 1948 : **38** : p. 9. (Abst.)

From pedigreed monosporidial cultures of opposite sex, F_1 hybrids were obtained between *U. striiformis* f. *Hordei* and two races of *U. bullata*, *Agropyron trachycaulum* and *Elymus canadensis* being the common hosts from which the parental cultures were obtained. Without exception, the F_1 sori were of the stripe type characteristic of *U. striiformis*. The percentage of F_2 infection, obtained by use of the F_1 spores as inoculum, was too low to allow the determination of genetic ratios of segregation. Three of the ten F_1 hybrids produced only the stripe type of sori in the F_2, one produced only the head type, two segregated into both types, and four failed to produce F_2 generations. The F_1 spores were minutely echinulate as compared with the prominent echinulations in *U. striiformis* and the rough verruculations in *U. bullata*. The F_2 sori of the head type contained verrucose spores, whereas the stripe type of F_2 sori contained echinulate spores.

1484. JOHNSON, T. 632.452:575.12
Intervarietal crossing in *Puccinia graminis* Pers.
Proc. Canad. Phytopath. Soc. 1947 : No. 15 : p. 14.

Intervarietal crosses have been made between the varieties *Tritici*, *Avenae*, *Secalis*, *Agrostidis* and *Poae* of *P. graminis*. The degree of fertility varied considerably, according to the varieties hybridized, and in crosses between varieties *Tritici* and *Agrostidis* according to the direction of cross.

The hybrid rusts showed a wider range of pathogenicity than the parental varieties but were weaker in pathogenic vigour. It is thought that this weaker pathogenicity and the intervarietal sterility prevents the natural occurrence of hybrid rusts.

1485. RAYCHAUDHURI, S. P 632.484:575.242
Saltation in *Helminthosporium Oryzae* Br. de Haan.
Sci. and Cult. 1947 : **13** : 77–78.

A new sterile form of *H. Oryzae* with pink hyphae which appeared in several cultures of a fertile, dark brown strain is described. Reversion was observed in a few cultures. The number of patches of mycelium producing the sterile form and the areas occupied by them increased with the age of the parent cultures.

The pathogenicity of both forms was tested by inoculating different varieties of aus and aman rice. The results show that the parent form is much more virulent than the saltant.

1486. Christensen, J. J. and Schneider, C. L. 632.484:575.242:633.11
The effect of repeated passage of *Helminthosporium sativum* through the host on genetic variation and pathogenicity.
Phytopathology 1948 : **38** : p. 5. (Abst.)

A line of *H. sativum* derived from successive monosporous isolations and grown on artificial media for 28 years was grown on Marquis wheat for ten successive generations. With the exception of five mutants, the 14,400 monosporous progenies obtained from the host were identical in cultural character with the original line. Cultures of these mutants showed marked differences in comparison with each other and the parent line in colour, type and rate of growth, and amount of sporulation. The virulence of the original line was not found to change in five successive generations on wheat host plants.

1487. Snyder, W. C. and Hansen, H. N. 632.484:578.088
Classification and identification in *Fusarium*.
Phytopathology 1948 : **38** : 23–24. (Abst.)

The classification of the genus *Fusarium* is discussed. A system of classification in which only a few species are recognized, on the basis of morphology, and pathogenicity is indicated by named forms and numbered races within the form is advocated. This system has been found in practice to facilitate identification.

INSECTICIDAL PLANTS 632.951.1

1488. Roark, R. C. 632.951.1
Some promising insecticidal plants.
Econ. Bot. 1947 : **1** : 437–45.

The following plants have been found promising as sources of insecticides as a result of investigations in the United States: *Haplophyton cimicidum* A.DC., *Heliopsis longipes* (A. Gray) Blake, *Ryania speciosa* Vahl., *Tripterygium Wilfordii* Hook., *Anabasis aphylla* L., *Croton Tiglium* L., *Ricinus communis* L., *Amorpha fruticosa*, *Schoenocaulon officinale* (Schecht. et Cham.) A. Gray, *Sesamum indicum* L. (*S. orientale* L.), *Pinus palustris* Miller, *Phellodendron amurense* Rupr., *Zanthoxylum Clava-herculis* L., *Aeschrion excelsa* (Swartz) Kuntze, *Quassia amara* L., *Duboisia Hopwoodii* F. Muell and *Nicotiana* spp. A bibliography of 49 references is appended.

1489. Higbee, E. C. 632.951.1(8)
***Lonchocarpus*—a fish-poison insecticide.**
Econ. Bot. 1947 : **1** : 427–36.

A general account is given of *Lonchocarpus*, wild and cultivated roots of which have been imported from Brazil and Peru into the United States for the manufacture of insecticide, on an increasing scale since the cessation of supplies from the Far East. The article includes sections on the taxonomy of the commercial species, the production and cultivation of the crop in South America, and work on the selection of strains with high rotenone content in Brazil, Peru and Ecuador.

ECONOMIC PLANTS 633

1490. Knight, R. L. 633:576.12:575.113
The role of major genes in the evolution of economic characters.
J. Genet. 1948 : **48** : 370–87.

It is shown that pre-adaptation, i.e. the existence of genes in a crop before the need for them arises, is not uncommon and an argument is advanced to show that the genes involved may be expected to be one or a few major genes in most cases. The importance of major genes in disease resistance is illustrated by examples; it is thought to be due to the major part played by pre-adaptation in the evolution of resistance. The role of major genes in determining other economic characters is also illustrated by examples from 37 crop plants and by

yeast. About half the 160 economic characters involved are considered to be pre-adaptational and their control by one or a few major genes is not, therefore, unexpected.
It would seem then that major genes play a greater part in determining economic characters than is generally supposed. Usually, however, they are accompanied by a complex of minor and modifying genes. It is pointed out that complex inheritance is not necessarily polygenic but can easily be misinterpreted as such.

1491. 633–1.524

Technical Advisory Services go forward.
F.A.O. Information Serv. Bull. 1947 : **2** : No. 6 : 9–10.

It is reported that the Food and Agriculture Organization is supplying hybrid maize from the United States for field tests in Europe.
FAO has also arranged for the supply of seed of blight resistant chestnut (*Castanea mollissima*) to be sent from China to Italy. In return the Chinese Government has requested the provision of pecan seed for experimental work.
At the request of the Venezuelan Development Corporation, a mission has been sent by FAO of scientists from the United States to study the possibilities of industrial utilization of wild oil-bearing plants in Venezuela and to recommend the introduction of cultivated oil seed plants.

1492. 633–1.524(54)
633:575(54)

Pal, B. P.
Botany and human welfare.
Indian Fmg 1946 : **7** : 486–501.

This article is the text of the presidential address delivered to the Botany Section of the 1946 Indian Science Congress. It draws attention to the work of plant introduction, particularly in Russia and the United States, and briefly defines the functions of the proposed Bureau of Plant Introduction in India. The remainder of the address reviews progress in breeding work on various crops in India.

1493. Randhawa, M. S. 633–1.524(54)
Plant exploration and introduction service for India.
Indian Fmg 1946 : **7** : 448–51.

The value of plant introduction is discussed with reference to the most important introductions in India, the United States and U.S.S.R. Possible sources of useful introductions for India are indicated. A scheme for the establishment of a Bureau of Plant Introduction on American lines has been sanctioned by the Indian Council of Agricultural Research. The central station of this Bureau will be established at the Indian Agricultural Research Institute, Delhi.

1494. Alfani, A. 633–1.524:581.056(45)
Lo scambio internazionale dei semi secondo le analogie agroclimatiche dei vari paesi. ((**International interchange of seed according to the climatic analogues of the various countries**).
Ital. Agric. 1948 : **85** : 125–27.

Reference is made to the work of the American Institute of Crop Ecology and it is stated that a start has been made in Italy in collecting data on climatic analogues which should serve as a useful guide in future work on plant introduction and plant breeding.

1495 633.00.15(48.9)
Beretning fra Statens Planteavlsudvalg for Finansaaret 1944–45. (**Report of the State Committee for Plant Cultivation for the financial year 1944–45**).
København 1945 : Pp. 109.
Beretning fra Statens Planteavlsudvalg for Finansaaret 1945–46. (**Report of the State Committee for Plant Cultivation for the financial year 1945–46**).
København 1946 : Pp. 86.

Both the above reports contain the usual information about official stations, institutes, committees, regulations, etc., connected with plant cultivation at various experiment stations and other centres in Denmark.

Owing to the war no consultative meeting to plan further research could be held in 1945, but in 1946 the usual meeting took place, and the following points from the report from the State Committee for Plant Cultivation and from the discussions on the programme of work are of interest:—
H. Bragge was appointed to represent the committee for Plant Cultivation on the board of the Danish Flax Research Institute [Dansk Hørforskningsinstitut].
Steps have been taken towards the setting up of a joint committee to deal with problems and research programmes in connexion with the new experimental stations and with others that may be established later for various regions in Denmark.
The plan of research for 1946–47 was approved.

CEREALS 633.1

1496. 633.1:575(43.8)
633.491–2.7–1.521.6:575.12(43.8)
Państwowe Zakłady Hodowli Roślin. (**The Government Institutes of Plant Breeding**).
Przegl. Roln. Poznań 1947 : **2** : 332–34.
The difficulty of combining high yield in a variety of a cereal with a capacity for adaptation to varied conditions of soil and climate can be overcome by breeding and the Polish Government Institutes of Plant Breeding have developed series of varieties showing high yields throughout Poland. Examples of such varieties are: Kleozczewskie rye, Browarny P.Z.H.R. barley, the oats Przebój [Force] II and I, and the spring wheats Opolska and Rokicka.
Large scale experiments are being made at the institutes on crossing cultivated with wild forms of potato which are resistant to the Colorado beetle. This method of crossing with wild forms is also applicable in breeding varieties of potato resistant to diseases.
Increased protein content is one of the aims in the breeding of fodder plants. E. W.

1497. 633.1:575(48.5)
633.1–2.111–1.521.6(48.5)
Andersson, G. 633.00.14(48.5)
Invigning av nybyggnad vid Värmlandsfilialen. (**Inauguration of the new building at the Värmland Branch Station**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 515–21.
The opening of the new building of the Värmland Branch Station of the Swedish Seed Association was made the occasion of a celebration of the work which the Station is doing along such lines as cereal breeding, frost resistance and variety trials.

1498. Batalin, M. 633.1:575"793":581.46:578.088
Laboratoryjne odróżnianie ozimych i jarych form pszenicy, żyta i jeczmienia. (**Laboratory method of distinguishing winter and spring forms of wheat, rye and barley**).
Roczn. Nauk Rol. 1947 : **49** : 417–25.
The method is based on differences in development of the growing point. If seeds of the above three cereals are sown, the growing points of both winter and spring varieties are at first, for a short time, similar in dimensions, but six to twelve days after germination the growing points of spring grain are found to have developed irregularities where the ears will later form, whilst the growing points of winter grain are still small and wart-like.
In using this method, for which a magnifying lens is needed, it is important that only the growing point on the main tiller is chosen for the comparison. E. W.

1499. Smith, L. 633.1:581.142:581.46
The effect of chaff of cereals on germination of seeds and on the growth of mold.
J. Amer. Soc. Agron. 1948 : **40** : 32–44.
A study was made of the effect of chaff on the germination of seeds of the following cereals: six varieties of *Triticum vulgare*, a mixed lot of F_2 spikes from hybrids between unidentified

varieties of *T. vulgare*, three varieties of *T. durum*, and three stocks of einkorn; two hulled and one hull-less oats; two hulled and two hull-less barleys, and also two lines of barley which were homozygous except for the hulled character.

1500. ÅKERMAN, Å.
LINDBERG, J. E. and
AUGUSTIN, S. 633.1:581.6(48.5)
Undersökningar av kvaliteten hos 1946 års brödsädesskörd. (**Investigations of the quality of the 1946 crop of bread cereals**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 427–59.

This detailed account of the analysis made by the Cereal Laboratory of the Swedish Seed Association on the quality of rye and spring and winter wheat of the 1946 harvest in Sweden contains information on the collection of samples; their distribution by districts and varieties; analytical methods; results of the analyses of quality; diastatic condition; crude protein content; baking tests; and determinations of flour quality. Crop reports from various districts supplement the above information.

1501 633.1:582
633.2:582
HENNING, E. 633.31/37:582
Klucz do określania traw i roślin motylkowych w stanie bezkwiatowym. (**Diagnostic key to grasses and papilionaceous plants in the non-flowering state**).
Biblioteka Puławska, Puławy 1947 : No. 27 : Pp. 76.

This key is a translation into Polish from the German edition of E. Henning's key, which has also been supplemented by the Polish translator.
To facilitate recognition of the grasses and the more important papilionaceous plants short descriptions of the habitats have been added. Alphabetical indexes of the Polish and Latin names are given, also nine plates with drawings showing detail in some plants. E.W.

1502. HELLBO, E. 633.1–1.521.5(48.5)
Vanlig statsplombering av utsäde. Ändrade fordringar för efterkontroll-lodling. (**Ordinary official certification of seed corn. Changes in the requirements for post-control culture of seed**).
Lantmannen 1947 : **31** : 1102–03.

The requirements regarding seed culture following certification in Sweden are cited *in extenso* from notification No. 6, 1947, of the Swedish Agricultural Board (Lantbruksstyrelsen).

1503. 633.1–1.531.12(41.5)
633.16.00.14(41.5)
Report of the seed propagation division, 1946.
J. Dep. Agric. Éire 1947 : **44** : 91–107.

Information is provided on the selection of pure lines of Spratt-Archer and various other barleys at the Cereal Station, Ballinacurra, Co. Cork, and their further propagation by farmers in the neighbourhood of Ballinacurra.
Large scale barley varietal trials were carried out at ten centres in seven counties to test the varieties Spratt-Archer 37 No. 3, Spratt-Archer 37/9 x Golden Archer 2 No. 1, Beaven's 54/12/3 and Spratt-Archer 37 No. 3 H.9 x Golden Archer 2 No. 2.
One of the three half-drill strip experiments carried out comprised a test of Spratt-Archer 37 No. 3 against Spratt-Archer 37/9 x Golden Archer 2 No. 2.
Nine small scale quantitative experiments are also reported. In each experiment eight varieties or selections were tested in randomized blocks. The material tested included new Spratt-Archer, Spratt-Archer x Archer and Spratt-Archer x Kenia hybrids.
Pedigree stocks of the oats varieties Glasnevin Triumph, Victory II, Andri and Glasnevin Success X are under multiplication. Pure line stock of the oats Black Tartary and the

wheats Red Marvel and April Red were maintained at the Cereal Station; further propagation of April Red was carried out in the neighbourhood.

1504. Dobben, W. H. 633.1–1.531.27(49.2)
Phaenologische waarnemingen aan een zaaitijdenproef met granen. (**Phenological observations on cereals in an experiment with different sowing dates**).
Landbouwk. Tijdschr. Wageningen 1947 : **59** : 485–95.

Periodical sowings of wheat, barley and rye varieties were made from 25 September until 15 May. Observations are recorded of dates of emergence of ear, yield, 1000 grain weight and length of straw. A month's delay in sowing in the autumn resulted in a week's delay in the appearance of the ears and four days' delay in ripening.
Late sowing if it results in insufficient vernalization may result in absence of ear. Bersee wheat never shows lack of vernalization. The winter varieties used were Criewener 192, Jubilé, Elisabeth, Alba and Juliana, the spring wheats, van Hoek and Carma. Vindicat represented the winter barleys and Petkus the winter ryes. Spring rye sown on 15 May was in ear on 24 June, i.e., in 40 days.
Lack of vernalization delays shooting but not ripening. Large grained varieties of wheat take longer to ripen than small. Early sowing results in a cooler ripening period and this results in better filled kernels. C. B

1505. Kopetz, L. M. 633.1–1.557:578.08:575
Die Bedeutung ertragsanalytischer Studien für die Beurteilung pflanzenbaulicher und pflanzenzüchterischer Massnahmen im Getreidebau. (**The significance of studies of analysis of yields for estimating the value of methods of plant cultivation and plant breeding in the growing of cereals**).
Bodenkultur 1947 : No. 1 : Pp. 15.

The author defines more precisely the term "density of stand" and points out that the other factors in "yield", the 1000 corn weight and number of grains per ear, are properties of a single individual, whereas density of stand is a property of the plant community and is, moreover, typical for a variety. These views must lead to a new outlook on the relation between tillering and the development of a given density of stand. The capacities for tillering and for forming a certain density of stand, both varietally specific, often show marked independence of each other. The number of ear-bearing shoots is the result of two genetically controlled components, (1) for fertile tillering and (2) for the density of stand; both components enter simultaneously into yield formation under optimum conditions. For the term "yield" as ordinarily used the author uses the term "morphological yield". Examples are given of analyses of morphological yields of varieties of rye, winter wheat and winter barleys. To show the different causes of yield in the case of continental and maritime varieties, yield figures for winter wheats and ryes are analysed on the basis of the author's equation for yield. Analyses of yields of two-rowed and four-rowed barleys are specially compared, as the causes of yield here are basically different from those in the cases of wheat and rye. For barley the density of stand and 1000 corn weight are the predominating factors in yield formation, whereas in the case of oats the density of stand is only slightly affected by the variety and a high number of grains per panicle is the main component of yield. Herein lies the cause of failure of oats in dry regions, since the physiological requirements of the panicles cannot be supplied; a similar explanation applies to the failure of maritime varieties of wheat in dry districts, since the main component of yield here is development of the ear.
The author's analyses of morphological yields emphasize the importance of the choice, registration and description of varieties for future cultivation and breeding of cereals. The choice of suitable varieties for certain climates can be made more reliably when the predominating and subordinate components of their yields are taken into account under field conditions. In general a sufficiently high density of stand is the surest basis for high yield, the number of grains per ear being of secondary importance. This deduction has its application in breeding types suitable for cultivation in unfavourable conditions. E. W.

1506. 633.1–2.111–1.521.6(48.5)
EKSTRAND, H. 633.14–2.111–1.521.6(48.5)
Höstsäden och vinterhärdighetsproblemet med särskild hänsyn till resistensen mot vissa svampsjukdomar. (**Winter cereals and the problem of winter hardiness with special regard to the resistance to certain fungi**).
Medd. Växtskyddsanst. Stockh. 1947 : No. 50 : Pp. 28.
This paper recapitulates and elaborates the article reviewed under Abst. 150.

1507. 633.1–2.4–1.521.6:575(54)
PADWICK, G. W. 635.657–2.421.9–1.521.6:575(54)
Plant protection and the food crops of India. Part 1. Plant pests and diseases of rice, wheat, sorghum, and gram.
Emp. J. Exp. Agric. 1948 : **16** : 55–64.
A survey is given of the diseases and pests attacking wheat, sorghum, rice and gram (*Cicer arietinum*) in India, with reference to the losses caused, present methods of control and the future research on control which should be undertaken. In addition to chemical and other methods of control, the achievements in breeding for resistance and future possibilities in this direction are briefly considered in the case of the following disease-causing organisms: *Puccinia graminis, P. triticina, P. glumarum, Ustilago Tritici* and *Urocystis Tritici*, attacking wheat; *Helminthosporium* leaf spot and blast (*Piricularia Oryzae*) of rice; and gram blight (*Mycosphaerella Rabei*).

WHEAT 633.11

1508. FRANKEL, O. H. 633.11(93.1)
Survey of wheat growing districts. Areas and yields of varieties, 1947.
N.Z. Wheat Rev. 1947 : No. 57 : 48–59.
A survey is given of wheat variety yields recorded in different districts of New Zealand for the 1947 harvest. Varietal recommendations are made for the different regions.

1509. 633.11(94.4)
633.11–2.452–1.521.6(94.4)
Varieties of wheat recommended for 1948 sowing.
Agric. Gaz. N.S.W. 1948 : **59** : 3–9.
Recommendations are made for the cultivation of wheat varieties in the different districts of New South Wales. Descriptive notes are given of Baroota Wonder, Bencubbin and 19 other varieties. In view of the severe epidemic of rust in 1947, increased cultivation of the resistant wheats Gabo, Charter, Yalta, Kendee and Celebration is advocated.

1510. MAMONTOVA, V. N. 633.11:575(47)
(**Varieties of spring wheat from the Institute of Grain Husbandry for the South-East of the U.S.S.R.**)
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : Nos 2–3 : 23–34.
Reference is made to the production of the spring wheats Lutescens 62, Albidum 721 and Albidum 604 by selection from Poltavka, of Erythrospermum 341 by selection from the local awned wheat Selivanovskiĭ Rusak, of Hordeiforme 432 by selection from the local *Triticum durum*, and of Sarrubra and Sarroza by crossing Poltavka (*T. vulgare*) x Beloturka (*T. durum*); of all the awnless spring wheats of the U.S.S.R., Sarrubra is unequalled in milling and baking quality and in freedom from shedding, though in disease resistance it is defective. Other promising wheats produced from crosses of *T. vulgare* x *T. durum* were the awned soft wheats Erythrospermum 82/02 and 78/01, both of which have outyielded the soft awned variety Erythrospermum 341, and at the same time are resistant to shattering and have grain of high quality. Awnless forms of *T. durum* have been obtained from crosses of Hordeiforme 432 with Lutescens 62, Candicans 75/09 after 12 years of selection, Candicans 76/10 after seven years. In yield they have equalled Hordeiforme 432 and they are three to five days earlier, and more drought resistant.

Lutescens 62 and Erythrospermum 341 were crossed with Marquis, Kitchener and other disease resistant North American varieties and the new forms obtained in this way include Lutescens 605 and 758, both of which are resistant to brown rust and lodging. Some other promising varieties, including one resistant to loose smut, Lutescens 55/11, have been produced from natural hybrids of Erythrospermum 341.
Data on the behaviour of the different varieties in the various zones of the Saratov province are given, and show that in all zones but one Lutescens 62 has been excelled by one of the newer varieties. The most constant yield over a period of years varying widely in weather conditions was given by Lutescens 53/12.
The Saratov varieties have done well also in the Stalingrad, Rostov and other provinces. A number of new hybrids are also under observation, some of them combining resistance to lodging, brown rust, loose smut and shedding, others resistance to brown and yellow rust and mildew.

1511. 633.11:575(73)

Disease-resistant wheat bred for humid coasts.

Sth. Seedsman 1948 : **11** : No. 3 : p. 50.

Seabreeze is a new rust resistant wheat developed by the Texas Agricultural Experiment Station in co-operation with the United States Department of Agriculture. It is an example of the rust resistant wheats that are being bred for the southern states to minimize the dispersal of infection by spring winds to regions further north. Seabreeze is adapted to a belt from the Lower Rio Grande to Louisiana. It has given yields of 20 to 30 bushels per acre. The variety provides winter pasture, hay and silage. It has been developed primarily as a wheat for feeding livestock, the protein content of the grain being high Seabreeze is also resistant to loose smut and mildew.

1512. 633.11:575(93.1)
633.11:581.6(93.1)

Work in progress at the Wheat Research Institute.

N.Z. Wheat Rev. 1947 : No. 57 : 36–41.

Among the wheat lines retained for further trial after the first field trial are the high yielding line 192,01 from the cross (64,02 x Cross 7) x (Tainui x Cross 7), the high yielding line 210,01 from the cross (Dreadnought x 64,02) x (Tainui x Cross 7), and unusually large grained lines from crosses No. 387 (85,03 x Dreadnought) x (Tainui x Cross 7).
Investigations are being carried out at Lincoln to obtain information on the mode of inheritance of yield components and other desirable agronomic characters with a view to facilitating selection in the early generations of wheat hybrids. An experiment has been begun to study the persistence of hybrid vigour and the extent to which it affects yield in the early hybrid generations. Work on the problem of how selection is affected by hybrid vigour is now almost complete. A long term study of the value of different methods of single plant selection has been begun. The back-crossing technique is being used in an attempt to develop an earlier variety of the Dreadnought type. The inheritance of protein content and resistance to shaking is under investigation. The analysis of data on the inheritance of yield components, collected over several years, is in progress. It is mentioned that such investigations have become practicable by the use of punched card methods for statistical collation.
Research work on baking quality being carried out at the Wheat Research Institute is directed towards the improvement of the baking performance of high extraction flour, and ascertaining whether this is possible without detrimental effect upon the vitamin content of the flour; the role of oxidizing enzymes in the development of crumb colour and in the maturation of the dough is being studied.

1513. Frankel, O. H. and
Hullett, E. W. 633.11:575(93.1)

Hilgendorf, a new wheat of outstanding baking quality.

N.Z. Wheat Rev. 1947 : No. 57 : 29–33.

The new wheat variety Hilgendorf, developed at the Wheat Research Institute, Christchurch, New Zealand, from the cross Tainui x Cross 7, is to be distributed. Its baking

quality is comparable with that of Canadian flours. Bread made from the flour of Hilgendorf has exceptionally good keeping quality. The average protein content of Cross 7 in 18 trials was 9·9%, that of Hilgendorf 11·8%. Information on the yielding capacity of Hilgendorf is still limited. The results of three years' field trials suggest that the variety is not such an all-round wheat as Cross 7 or Fife-Tuscan, and that the conditions under which it gives a satisfactory performance are more restricted. The variety more closely resembles Tainui than Cross 7. It is slightly shorter strawed than Tainui, and its red-skinned grain is larger than that of Cross 7. It matures over a week earlier than the latter variety.

1514. 633.11:575.061.6

BLARINGHEM, L. 633.11:581.483:575

Pigments anthocyaniques et hérédité unilatérale. (**Anthocyanin pigments and unilateral inheritance**).

Rev. Hort. Paris 1944 : **29** : p. 123.

It has been shown that in the progeny of wheat crosses the inheritance of anthocyanin pigmentation is unilateral. Segregation for endosperm characters in crosses involving *Triticum monococcum* is discussed.

1515. VANNUCCINI, G. 633.11:575"793"(45)

Le razze di frumento. (**Races of wheat**).

Ital. Agric. 1947 : **84** : 548–52.

The numerous factors which have contributed to the marked reduction in wheat yields per acre in Italy in the last few years are discussed. Experience has shown that early maturing varieties have stood the test best and this gives a direction for future breeding work. However the need for conserving stocks of the old varieties characteristic of the different regions should also not be overlooked.

1516. TORSSELL, R. 633.11:575"793"(48.5)

633.11–2.112–1.521.6:575(48.5)

Höstveteförädlingen vid Sveriges Utsädesförenings Ultunafilial. (**The breeding of winter wheat at the Ultuna branch station of the Swedish Seed Association**).

Sverig. Utsädesfören. Tidskr. 1947 : **57** : 179–96.

The main aims in the production of a winter wheat for Central Sweden have been winter hardiness, earliness, high yield, strong straw, good baking quality, resistance to pests and diseases, and as far as possible an ear suitable for machine threshing. A detailed and documented account is given of the procedure adopted at various stages in the breeding programme with the above object in view. The record covers: (1) early selection work with land wheats from Central Sweden; (2) the hybridization of Pudel with Swedish land wheat, which resulted in the production of Thule II and Svea; back-crossing of Thule to the land wheats 0760 and 0762, resulting in the production of Thule III and Svea II; (3) crossing with new southern Swedish varieties, e.g. Pansar, Sol II and Kron, culminating in the production of Gluten; (4) crossing of Ergo and Gluten from which were obtained 01392 and also 01395 which is to be put on the market as Odin wheat; and (5) extensive breeding work based on crosses between Gluten and various autumn wheats.

A schematic representation, from unpublished work by Åkerman and MacKey (1946), shows the lines followed in working with the various generations of progenies from the Ergo x Gluten cross. A tabular summary is also given indicating the performance of lines from various crosses between Gluten and other autumn wheats, e.g. 01250 b, Bore II, Gyllen II, Ergo and Äring.

The results of extensive line selection practised at Ultuna with Central Swedish land wheats suggest that the populations used as a source of breeding material were somewhat poor in valuable biotypes, probably as a consequence of the severe and prolonged selection which such wheats have undergone in Central Sweden. A marked advance regarding yield was obtained with wheats from other tracts, e.g. 0760 and 0762, whose origin is unfortunately not more exactly known. By direct line selection, however, well adapted types and also forms with desirable characteristics such as 00701 for use in breeding for high quality may be obtained.

Much difficulty has been experienced, especially in using land wheats or material derived from them, in combining adequate strength of straw with good winter hardiness and resistance to drought. The shorter straw and other features connected with good strength of straw do not appear to be associated with the other land wheat characteristics.
In general, crosses between varieties that differ greatly genetically have not given direct results of practical value, e.g. Kron x Svea II and Pansar x Thule II, but back-crossing has been more successful and has produced Odin from which an increase in grain yield of probably not less than 20% can be expected.
Future breeding will be to a large extent based on crosses of Odin and its sister varieties with (1) the best, high yielding southern Swedish varieties, and (2) various land wheats with marked winter hardiness and good baking quality, e.g. 00701 and some of the land wheat lines produced by the Värmland Branch Station of the Swedish Seed Association.

1517. Pires, D. R. V. and
Pereira, A. M. 633.11:575.12(46.9)
Acerca do valor de duas formas novas de trigo. (**The value of two new forms of wheat**).
Rev. Agron. 1945 : **33** : No. 2 : Pp. 6.

Lines 15 and 16 of Mentura x Môcho de Espiga Branca 2023 (White-eared Môcho 2023) have been tested against Quaderna and Ardito for suitability for Portuguese conditions. Line 15 shows some promise for poor soils.

1518. Schneidermann Ja. A. [Šnaĭderman, Ja. A.] 633.11:575.127
(**Forms of perennial and autumn tillering wheat**).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming)
Saratov 1946 : Nos 2–3 : 145–51.

A recapitulation is given of the work on interspecific and intergeneric crosses made at the Saratov institute by Šehurdin, Meĭster and, later, Cicin, followed by a description of the most promising perennial hybrids and of those with the property of autumn tillering.
Perennial wheats Nos 818 and 823, from selections from the F_5 of a cross *Triticum sphaerococcum* x *Agropyron elongatum*, when sown in autumn 1944, came through the winter with survival rates of 97·2% and 97·0% respectively, compared with a survival of 76·2% in the winter wheat Hostianum 237. Earing was 8–10 days later than in Hostianum 237 and the period from earing to ripening was longer.
Observations on 474 different forms of perennial wheat in 1944 and 1945, both bad years for fungus attack, showed 469 of them to be entirely free from brown rust and only one was infected badly; all forms remained free from yellow rust and all but two free from mildew. The average grain yield per plant in Nos 818 and 823 was 3·6 grm. but some yielded up to 8 grm. per plant. Both these hybrids have awnless ears with smooth chaff and tough rachis, are difficult to thresh and have short, red, vitreous or semi-vitreous grain, with a thousand corn weight of 18 grm.
Nos 559 and 560, from the F_4 of a cross of the winter wheat Lutescens 329 x *A. elongatum*, yielded only 0·67 grm. of grain per plant, being characterized by open flowering and cross-pollination; they had large, red, vitreous grains with a thousand corn weight of 26 grm.
All the perennial wheats have a number of defects such as late maturity, rough ears and small grain and further breeding work is being directed towards removing these defects.
Among the more recent hybrids, one series, obtained from the F_6 of a cross *T. sphaerococcum* x *A. elongatum*, bore ears in 1944 and 1945 and tillered again at the end of 1945 in preparation for a third year. The ears contained over 50 grains each and some as many as 70, owing to the large number of florets per spikelet. The ears and grain were of the wheat type. Another promising hybrid, No. 2271, was selected from the F_4 of a cross of Lutescens 329 x *A. elongatum*; it has borne ears for two successive years, and in the first winter it had a survival rate of 94·6% as compared with 76·2%; its ears are of the wheat type and it has not been attacked by brown or yellow rust or by mildew.
Plants with a still more wheat-like ear were selected from the F_3 of a cross *T. turgidum* x *A. glaucum*; when sown in autumn 1943 they bore ears in 1945 and in autumn tillered afresh, producing a good growth in spring 1946; the grain was vitreous and wheat-like.
A number of other wheat-like hybrids have the faculty, when autumn sown, of producing a

crop of grain and then tillering afresh and producing a hay crop, after which they die. The highest grain yield from these types was obtained in 1945 with 14·88 c. per ha. These hybrids are awnless, have wheat-like ears and grain and have remained free from attack by brown and yellow rust and mildew. The yield of autumn hay varied from 12 to 24 c. per ha. By sowing them in the spring two hay crops are obtained, in the autumn of the first and second year respectively, with a grain crop in between. Further selection work is being continued with this type.

1519. Åkerman, Å. and
MacKey, J. 633.11:575.242:575.114
A genetical analysis of some speltoid strains.
Hereditas, Lund 1948 : **34** : 301–20.

A genetical analysis is given of six speltoid strains of spring wheat, and the bearing of the results on the cytological observations of other workers is discussed. Subcompactoids appeared as direct segregates from C heterozygous speltoids. Their probable chromosome constitution is discussed. An explanation is presented of the characteristic types of progeny ratios of the A, B and C speltoids; the differences are attributed to the elimination of C chromosomes at meiosis, the lower functioning ability of speltoid-bearing pollen and the directed elimination of zygotes.

1520. Sánchez-Monge, E. and
MacKey, J. 633.11:575.242:576.356
On the origin of subcompactoids in *Triticum vulgare*.
Hereditas, Lund 1948 : **34** : 321–37.

In order to throw some light on the problem of the origin of subcompactoids, which arise as segregates of heterozygous speltoids of the B series, the behaviour of the C univalent during meiosis in such heterozygous B speltoids has been investigated. A genetic analysis of the material used is given by Åkerman and MacKey (cf. Abst. 1519). Transverse division of the C chromosome occurred at both first and second telophases. The origin of subcompactoids and the complicated types of segregation from heterozygous B speltoids are discussed with reference to this observation.

1521. Popoff, A. [Popov, A.] 633.11:575.255(49.7)
(Chimaeras in wheat).
Annu. Univ. Sofia. Fac. Agron. Sylvicult. Livre 1.—Agron. 1942–1943 : **21** : 63–90.

In the Bulgarian experiments discussed, chimaeras occurred in large numbers and in great variety. They were of two types: on the same plant there were in the first type awned and unawned ears, and in the other type normal ears and ears similar to those in squarehead wheat. The possible origin of these chimaeras is discussed. E. W.

1522. 633.11:576.356.2:575.114
Smith, L. 633.11:575.116.1
A haplo-viable deficiency-duplication from an interchange in *Triticum monococcum*.
Bot. Gaz. 1948 : **109** : 258–68.

Of 275 pollen mother cells of *T. monococcum* plants heterozygous for a reciprocal translocation referred to as "Ring No. 12", 56% had a chain of four chromosomes and 44% a ring of four chromosomes which suggested that one of the translocated segments was relatively short.

When selfed, the plants heterozygous for the reciprocal translocation gave rise to progeny of which about 93% appeared normal and 7% abnormal. Of the plants of normal appearance, approximately half had seven bivalents at meiosis while the rest had the ring or chain of four chromosomes. The 7% of abnormal plants had seven bivalents in some of their pollen mother cells and five bivalents and a chain of four chromosomes in others; in some cells, two pairs of chromosomes were attached but not in such a way as to form a chain.

It is concluded from the evidence that these plants with seven bivalents in some pollen mother cells and five bivalents plus a chain in others had received a gamete with a deficiency

and a duplication resulting from the segregation of the chromosomes with the translocated segments.
Transmission of the deficiency-duplication was almost entirely through the female gametes of plants with Ring No. 12 or with the deficiency-duplication. Plants with the deficiency-duplication produced an unusually large proportion of haploid and triploid progeny, most or all of the triploids having the deficiency-duplication.
The segregation ratios of two pairs of genes were altered by the deficiency-duplication. Twelve other pairs of factors in five different linkage groups were unaffected.
The possible use of the deficiency-duplication in determining the inheritance and linkage relations of genes is discussed.

1523 POPPOFF, I. [POPOV, I.] 633.11:581.142:577.15
(Relation between the capacity for germination and enzyme reaction during the germination of wheat grains).
Annu. Univ. Sofia V. Fac. Agron. Sylvicult. Livre 1. Agron. 1939–1940 : **18** : 279–322.

The wheat varieties used in this study were five widely cultivated Bulgarian varieties Nos 17, 11, 14, 16, 84 from the Agricultural Experimental Station in Sofia, and five foreign varieties, Tenmarq, Mentana, Hussar, Ardito and 534/1 from the Sadovo Research Station. Results have indicated that a marked relation exists between germination energy and diastatic activity. Thus wheat varieties with high germination energy show after softening in water, a minimal decrease in diastatic power and in the same softened grains after six hours of subsequent germination, the diastatic power is higher than that of the untreated grain. Further germination in such varieties produces a sudden rise in diastatic power. Wheat varieties with lower germination energy show a much larger decrease in diastatic power after softening, and only after 12–18 hours does their diastatic power exceed that of the untreated grain. The differences in the germination energy of different wheat varieties are genetically determined and correspond with differences in the rate of activation of their enzyme reactions. E. W.

1524. POPPOFF, I. [POPOV, I.] 633.11:581.142:577.15
(Relation between rate of germination and diastatic activity in dormant wheat grains).
Annu. Univ. Sofia V. Fac. Agron. Sylvicult. Livre Agron. 1940–1941 : **19** : 265–87.

Amongst the six varieties tested were Mentana and Tenmarq. Results show that diastatic activity of the ungerminated seed is not related to time required for germination, but the relation between the capacity for diastatic activation and the course of germination is such that the quicker the rate of germination, the quicker is the activation of the diastase and the greater the degree of activation E. W.

1525. HUTCHINSON, J. B.,
GREER, E. N. and
BRETT, C. C. 633.11:581.48:581.143.26(42)
Resistance of wheat to sprouting in the ear: preliminary investigations.
Emp. J. Exp. Agric. 1948 : **16** : 23–32.

A report is given of tests carried out at the National Institute of Agricultural Botany, Cambridge, and at the Cereals Research Station, St. Albans, to study the dormancy of the grain of wheat varieties and experimental hybrids at harvest. Germination tests at 15° C and 23° C. were carried out on the threshed grain at various stages of maturation. Tests were also carried out on the tendency of the grain to sprout in the ear; the ears were mounted on stiff wires set up vertically in turf under a small cage, and heavily sprayed for two hours three or four times daily; the ears were otherwise exposed to the normal fluctuations of the weather in the field; a period of seven days was found adequate to induce sprouting of a large percentage of grains in the ears of the less resistant varieties.
Considerable variation was shown by the varieties and hybrids in the dormancy of their grain at similar stages of ripeness, and in the length of their post-harvest maturation

periods. The white grained wheats included in the experiments were markedly less dormant than the red grained wheats.
The germination tests of the threshed grain revealed that varietal differences in dormancy are more clearly shown at 23° C. than at 15° C. The field tests on germination in the ear gave results similar to those obtained from laboratory tests carried out at 23° C.
The unsprouted damp grain threshed out at the conclusion of the tests of the grain in the ear showed varietal differences in their subsequent tendency to germinate. It is suggested that the ear exerts a restrictive influence on germination.
Experiments to test the possible effect of ear shape and habit upon tendency to sprout in the ear indicated that any influence of the ear type is negligible in comparison with the effect of the condition of the grain within the ear.
Further data are being collected for the whole range of temperatures suitable for the sprouting of the grain, which will provide the basis of a standardized technique for laboratory germination tests and field tests of grain in the ear.

1526. MARUŠEV, A. I. 633.11:581.6:575(47)
(The milling and baking qualities of varieties bred by the Institute of Grain Husbandry for the South-East of the U.S.S.R.).
Socialističeskoe Zernovoe Hozjaïstvo (Socialistic Grain Farming) Saratov 1946 : Nos 2–3 : 55–64.

A high correlation has been observed between the baking quality of the parents of a cross and the proportion of high quality offspring, though in crosses of *Triticum vulgare* x *T. durum* forms excelling both parents often occur, and Sarrubra, which came from such a cross, is one of the best wheats in the Soviet Union, in both milling and baking quality. Other varieties from the Saratov station distinguished by high baking quality are Erythrospermum 0341, 78/01, and 82/02 and Lutescens 53/12 and 55/11. All the *T. durum* varieties produced by the institute also have high baking quality, especially the two awnless varieties obtained from crosses with *T. vulgare*. The *T. durum* varieties all surpass Mindum in quality, and the *T. vulgare* varieties compare favourably with Thatcher and other American wheats.
The *T. durum* varieties also display good quality for macaroni manufacture; they have a high extraction, high gluten content and give a product with good consistency and physical qualities; the macaroni from the awnless varieties shows the minimum loss on cooling. Sarrubra and some of the other hybrids also produce good macaroni.

1527 TERPUGOV, D. I. 633.11:581.6:578.08(47)
(Estimation of the baking quality of wheat varieties in breeding work on small samples).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1947 : No. 8 : 17–22.

Descriptions are given of a simple apparatus for measuring the baking quality of small samples of wheat. A ball of dough prepared from 10 grm. of flour is put into a flask of distilled water at 30° C., the flask being connected with a eudiometer for measuring the volume of gas released and with a burette for measuring the increases in the volume of the contents of the flask and hence of the dough; the burette is equipped with a recording needle which registers the volume change on a rotating cylinder. From the character of the curves obtained it is possible to determine the rate of swelling of the dough, the volume of CO_2 produced by 100 grm. of flour, the gas retaining capacity of the dough, shown by the point at which the curve breaks, indicating the disintegration of the ball of dough, the number of minutes of fermentation required by the dough to achieve optimum properties, the ratio of the volume of CO_2 developed to the increase in dough volume during fermentation, and the amount of carbohydrate consumed per 100 grm. of dough during fermentation.
Illustrations are given of the curves produced by some typical types of wheat, showing that some are deficient in capacity for retaining the gas, others in capacity of gas formation and others deficient in sugars, so that after a prolonged period of fermentation they fail to swell at all. Some varieties are free from all these defects and are classed as optimum.

1528. Åberg, E. 633.11:581.6:631.8(48.5)
Sort- och kvävegödslingsförsök med höstvete vid Ultuna och Svalöf 1942–1946. (**Variety and manuring trials with autumn wheat at Ultuna and Svalöf 1942–46**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 385–418.
Results are examined with reference to the effects of manuring on protein content, hectolitre weight, 1000 corn weight, etc. in wheat varieties at Svalöf and Ultuna. No significant varietal differences in reaction to time of manuring were found at Svalöf, whereas at Ultuna a slight indication of such differences was noted.

1529. Åkerman, Å. 633.11:581.6:631.8(48.5)
Bakningsförsök med höstvetesorter från kombinerade sort- och kvävegödslingsförsöken på Svalöf. (**Baking tests with autumn wheat varieties from combined variety and nitrogen manuring trials at Svalöf**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 419–26.
The results of the baking tests given here are related to the calcium nitrate manuring trials at Svalöf. English translations of keywords in the tables are provided.

1530. Krasovskaja, I. V. 633.11–1.557(47)
(**The physiological characteristics of varieties of spring wheat in the South-East**).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : Nos 2–3 : 45–54.
Observations were made on five varieties of contrasting ecological type in 1945, which was a relatively wet year, and in 1946, a dry year. Comparison of the final yields obtained and the behaviour at the various growth stages showed that for the conditions of the south-east of the Soviet Union a variety must have the capacity to establish itself quickly in both root and shoot in the early stages, so as to make full use of the winter reserves of humidity. It should however not be too early maturing, so as to be capable of utilizing occasional summer rainfall if it comes, as does the variety Lutescens 53/12. The variety should have a fairly high tillering capacity, so that in wet years it can increase the number of grain-bearing ears and in dry years reduce the number without prejudice to the main ear. It should have a high rate of assimilation, as in Lutescens 62, but should not utilize the products of assimilation on excessive stem development as that variety does, but on intensive ear development, as do Albidum S–43 and Lutescens S–605. The variety should have the capacity to assimilate at low water contents and have a high hydrophilic index under conditions of drought, as in Lutescens 53/12, it should also have a high transpiration rate like Lutescens 53/12 but this should not be combined with high water requirements in the leaves during drought, as in Lutescens S–605.

1531. Bogdanov, P. N. 633.11–1.557:581.43
(**The root system and yield of spring wheat**).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : Nos 2–3 : 85–99.
Studies of the root system of a number of contrasting wheat varieties, growing under contrasting conditions, showed that the final yield is largely determined by the type of root system formed. The nodal roots are the chief factor and their development is determined by the presence of water in the upper layers of soil. If this is deficient, the nodal roots are defective or delayed and the plant is dependent on the embryonic roots; the yield rarely exceeds 4–5 c. per ha. If the nodal roots develop well and their activity is then interrupted by the drying out of the upper layers, very variable yields are obtained, depending on the degree of development of the embryonic and coleoptile roots, rainfall during grain formation and rust attack; such yields usually vary from 12 to 20 c. per ha. If the nodal roots develop well and function uninterruptedly, the moisture in both upper and lower soil layers is utilized and yields of up to 35 c. per ha. are obtained.
The problem of the husbandman is to achieve this last state by conserving humidity in the upper layers and that of the breeder is to develop varieties that are as much as possible independent of the moisture of the upper layers.

1532. Palmer, T. P. 633.11–2–1 521.6:575(93.1)
Disease resistant wheats.
N.Z. Wheat Rev. 1947 : No. 57 : 45–47.
Problems of breeding disease resistant wheats for use in New Zealand are discussed. The view is expressed that breeding for resistance to leaf rust, mildew and bunt is worth immediate attention.

1533. Atkins, I. M. 633.11–2.111–1.521.6
Freezing injury to small grains in Texas.
Plant Dis. Reporter 1947 : **31** : 171–73. (Mimeographed).
The wheat variety Austin was the most seriously damaged by cold in Kansas in 1946–47. In experiments to test the hardiness of new strains, selections from crosses of Sinvalocho x Wichita 3 and several crosses involving Fronteira showed differential injury, some of it serious.
Among barley varieties, Sunrise, Wong and certain hybrid strains were most susceptible while Ward and Reno were among the hardiest.
Survival of oat strains ranged from zero for many new strains selected from crosses involving rust resistant spring oats to about 100% for Fulwin and certain hardy selections. The survival of Fultex and New Nortex was approximately 30%. Among the more advanced strains, the Fulwin x Lee-Victoria strain (C.I. 4838) and reselections 3770–6 and 3770–9 survived both the 1943 and 1944–47 cold spells.

1534. 633.11–2.111–1.521.6(43)
Straib, W. 633.11–2.452–1.521.6
Beiträge zur Kenntnis der Frosthärte des Weizens. (**Contributions to the knowledge of winter hardiness of wheat**).
Züchter 1946 : **17-18** : 1–12.
In the severe winter of 1941–42 nearly all the approved German pedigree varieties of cereals died, whilst a number of varieties, in a collection of winter wheats from Gliesmarode containing over 1000 different varieties from various countries, survived more or less successfully. These surviving varieties were then subjected to artificial freezing tests at –12°C. and –15° C. and found to be highly frost resistant. It was concluded that winter-killing was the most important cause of the heavy mortality.
Experiments showed that there is no close correlation between the frost resistance and the tendency to shoot of varieties of wheat sown in spring. Some varieties increase their cold resistance in the course of the winter; others show a decrease towards spring time.
The majority of very frost resistant varieties of wheat were found to be fairly susceptible to *Puccinia glumarum*. Study of the cross Strubes Stocken winter wheat x Heines Kolben spring wheat showed no close linkage between the genes conditioning resistance to frost and to *P. glumarum*. E W.

1535. Šehurdin, A. P. 633.11–2.112–1.521.6:575(47)
(**Ways and methods of breeding spring wheat in the South-East of the U.S.S.R.**).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : Nos 2–3 : 11–22.
Figures are given showing that the average yield of Lutescens 62 over a period of 29 years has been 30% more than that of the local Poltavka from which it was selected; in drought years the difference was as much as 37·9%. Further improvements were effected by crossing with *Triticum durum*, and from these crosses the two awnless spring wheats Sarrubra and Sarroza were produced; in yield they equalled or excelled Lutescens 62, had vitreous grain of high quality and were free from shedding. Two awnless varieties of *T. durum*, Candicans 75/09 and Mutico-Valencia 31, were obtained from the same cross; they have proved more drought resistant than other varieties of the species but have yielded less than the awned varieties in most years.
The most drought resistant wheats from Turkestan and other arid zones were crossed with the local varieties and a number of promising varieties resulted, including Lutescens 53/12, and Albidum S–21, S–43 and S–210, all distinguished by greater yield and drought resistance than the standards, being less exacting as regards temperature and more resistant

to stem rust and brown leaf rust and to various insect pests. The best of the hybrids were later crossed with disease resistant American varieties; Lutescens 605 is a hybrid of Marquis x Erythrospermum 341 and Lutescens 758 a hybrid of Kitchener x Lutescens 62; both are resistant to brown rust and also to loose smut and to lodging. Albidum 21 and Albidum 210 are resistant to bunt.
In more recent years the awnless *T. durum* hybrids have been crossed with *Agropyron* spp., and forms with greater tillering capacity, resistance to stem rust and insect pests and with more vigorous root development have been selected.
In future, more attention is to be given to the improvement of *T. durum* varieties, which are still less reliable in yield than the soft wheat varieties.

1536. 633.11–2.112–1.521.6:575.127.2(47)
RJAZANOV, JA. I. 575:633:007(47)
(The creative career of a Soviet breeding scientist).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov
1946 : No. 2–3 : 5–9.
A review is given of the achievements of Alekseĭ Pavlovič Šehurdin, on the occasion of his sixtieth birthday. Thirty-five years ago he began selection work with spring wheats in the south-east of Russia and produced a number of varieties with improved yield and drought resistance. One of these was Lutescens 62, a selection from Poltavka distinguished by exceptional plasticity and adaptability; it was however inferior in grain size and quality and in resistance to shedding and to brown rust, and hybridization was resorted to; by crossing Poltavka with the local Beloturka (*Triticum durum*) the famous Sarrubra was produced, characterized by freedom from shedding, and very high milling and baking quality, whilst equalling Lutescens 62 in drought resistance and yield. He produced other varieties, such as Albidum S–43 and Lutescens 53/12 that have better developed grain, even in dry years.
He also produced many spring wheats suitable for growing under irrigation, including Lutescens S–605 and S–758, both brown-rust resistant varieties bred from crosses of local wheats with varieties from the U.S.A. His varieties Candicans 75/09 and 76/10 are awnless forms of *T. durum* obtained by crossing *T. durum* and *T. vulgare*, and have equalled or even surpassed the awned forms in yield.

1537. ATKINS, I. M. 633.11–2.183–1.521.6:575(76.4)
Inheritance of weight per unit length of culm and other characters in Kanred x Coppei wheat.
J. Agric. Res. 1948 : **76** : 53–72.
Weight per unit length of culm near the base of the wheat plant has been used successfully for several years at the Texas Agricultural Sub-Station, Denton, as an index of the resistance to lodging of winter wheat varieties and strains. The present paper reports investigations on the inheritance of weight per unit length of culm and other morphological characters in hybrids between the hard red winter wheat variety Kanred and the club wheat Coppei. The former variety is susceptible to lodging, and the latter resistant. The data obtained showed that selection for weight per unit length of culm, diameter of culm, plant height and length of head is possible in the early hybrid generations.
The inheritance of awns was determined by a single factor, the awnless condition being incompletely dominant in the F_1. Pubescence of glumes was controlled by a single dominant factor. Inheritance of head type was found to depend upon one major factor and also modifiers. Pubescence of glumes, head type and head length were independent of weight per unit length of culm. A low association between the awnless condition and the higher values for weight per unit length of culm was obtained.

1538. HENRY, A. W. and
GILPATRICK, J. D. 633.11–2.421.9:576.16:631.521.6:578.08
Relative pathogenicity of single and mixed strains of *Ophiobolus graminis* Sacc.
Proc. Canad. Phytopath. Soc. 1947 : No. 15 : 14–15.
It is suggested that mixtures of strains of *O. graminis* with different degrees of virulence

could be used advantageously in testing the reaction of wheat species and varieties. Virulent strains were not appreciably reduced in pathogenicity as a result of association with less virulent strains in mixed inocula.

1539. Jarkina, A. M. 633.11–2.45–1.521.6:575(47)
(Breeding spring wheat for resistance to fungus diseases).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : Nos 2–3 : 35–44.

There is evidence that a new biological race of brown rust, No. 109–S, has appeared recently in the Saratov area and that it is more tolerant of drought than the previous strains. A number of forms resistant to brown rust have been produced by selection after artificial infection. Selection for resistance to stem rust is also in progress, but here it is not possible to use artificial infection.

The progenies of a number of varieties resistant to loose smut (*Ustilago Tritici* Er.) were examined and the best varieties for use as parents were established. The varieties Pirotrix 1065, Lutescens 1422 and Lutescens 1465 combined immunity with high yielding ability. Selections resistant to bunt have also been made after artificial infection of various hybrid progenies.

1540. Wang, T. H. 633.11–2.451.2:576.16:631.521.6(51)
(Physiological forms of *Ustilago tritici* in China).
Fukien Agric. J. 1945 : **7** : 91–96.

Strains of *Ustilago Tritici* were collected from 21 districts in central and south China. They were tested on 33 varieties of wheat, nine of which were found to act well as differentiating hosts. Fourteen physiological forms of the fungus were isolated and a key is given. Specific host differences are very marked. Different strains of fungus exclusively infect *T. turgidum, T. compactum* and *T. vulgare.* H. C. Y.

1541. Moore, M. B. 633.11–2.451.2:576.16:631.521.6(73)
Parasitic races of *Ustilago tritici* on spring wheats.
Phytopathology 1948 : **38** : p. 18. (Abst.).

On the basis of pathogenicity to 12 varieties of spring wheat, including two varieties of *T. durum,* nine races of *U. Tritici* have been identified which primarily attack *T. vulgare* and two races which primarily infect *T. durum.* Some wheats such as Hope, Vernal, and *T. Timopheevi* are extremely resistant to all the races; some are immune to certain races and highly susceptible to others. Various types of resistance apparently exist, acting singly or in combination. A Thatcher x Supreza cross and two lines from Hope x (*T. Timopheevi* x Steinwedel) have proved resistant when inoculated with mixtures of four or five races, all of which were different. The variety Cadet was found to comprise two or more morphologically similar strains, one of which is resistant to several smut races which can attack the other.

1542. Bever, W. M. 633.11–2.451.2:576.16:631.521.6:575(73)
Physiologic races of *Ustilago tritici* in the eastern soft wheat region of the United States.
Phytopathology 1947 : **37** : 889–95.

In 52 collections of *U. Tritici* collected from soft winter wheats in the eastern United States, 11 physiological races have been identified on the basis of the reaction of ten differential wheat varieties. The results obtained suggested that it should be possible to breed soft wheats combining resistance to the 11 races and desirable agronomic characters.

1543. Kristev, K. K. [Krăstev, K. K.] 633.11–2.451.3–1.521.6(49.7)
(The stinking smut of wheat in Bulgaria and breeding smut resisting varieties).
Annu. Univ. Sofia. Fac. Agron. Sylvicult. Livre 1.—Agron. 1945–1946 : **24** : 405–75.

The results of bunt resistance tests on native and foreign wheat varieties are described. The only Bulgarian wheat not completely susceptible is Balvan 5 which showed strong resistance to race I. Of the foreign varieties, Hosar proved fully immune to both races I and II, while Ridit and Hope were highly resistant.

1544. Popp, W. 633.11–2.451.3–1.521.6:578.08
A rapid method of examining wheat heads for bunt infection.
Proc. Canad. Phytopath. Soc. 1947 : No. 15 : p. 14.
A method is described by means of which bunt infection can be rapidly detected by visual inspection (cf. Abst. 185).

1545. Dastur, J. F. and Pal, B. P. 633.11–2.452:576.16:631.521.6:575(54)
Wheat rusts and their control.
Sci. and Cult. 1947 : **13** : 91–98.
Reference is made to the breeding of rust resistant wheat varieties in various countries and especially in India. Future research in India should include (*a*) the study of varietal collections for rust resistance, (*b*) hybridization between suitable varieties to combine resistance with other desirable qualities, and (*c*) breeding work with the progenies of these crosses to obtain the desired strains.

1546. Harrar, J. G. and Borlaug, N. E. 633.11–2.452:576.16:631.521.6:575(72)
Stem rust of wheat in Mexico.
Phytopathology 1948 : **38** : p. 12. (Abst.).
The establishment of all the important physiological races of *Puccinia graminis* var. *Tritici* in the wheat growing regions of Mexico is becoming increasingly evident. Information is given on the distribution of races 17, 19, 38, 59 and 59A. The breeding of wheat varieties resistant to all the chief races in Mexico rather than to only the races at present predominant in the different regions appears to be necessary. Selections of Kenya, Trigo Supremo x 41–116, Fronteira x 41–116, Newthatch x Marroqui, Kenya x Aguilera and Mida x Pelón Colorado give promise of a high degree of resistance to the main physiological races in Mexico.

1547. Borlaug, N. E. and Rupert, J. 633.11–2.452:576.16:631.521.6:575.72
Leaf rust of wheat in Mexico.
Phytopathology 1948 : **38** : p. 3. (Abst.).
Leaf rust of wheat due to *Puccinia rubigo-vera* var. *Tritici* is becoming increasingly important in Mexico. Many varieties introduced into Mexico because of their brown stem rust resistance have been found highly susceptible to leaf rust. In addition, there is at least one physiological race in Mexico not commonly found elsewhere, which is highly pathogenic to a wide range of wheats, including varieties of *Triticum durum*. Mida and Trigo Supremo x 41–116 are considered to be the most promising sources of leaf rust resistance in breeding work. Newthatch and Kenya, commonly used as parents in breeding for stem rust resistance, are highly susceptible to leaf rust under Mexican conditions.

1548 Rütti, R. 633.11–2.452–1.521.6:575(49.4)
Beobachtungen über den Schwarzrost (*Puccinia graminis*) unter besonderer Berücksichtigung der Entwicklungsbedingungen im Kanton Graubünden. [**Observations on black rust (*P. graminis*), with special consideration of the conditions of development in the Canton of Grisons**].
Schweiz. landw. Mh. 1946 : **24** : 233–47.
Information is given on races and biotypes of *P. graminis*. The effects of characters of the genotype and environmental influences upon susceptibility to infection are discussed; the number of races of each biotype is given, but where many barberries are present new biotypes may arise.
Breeding and selection for resistant varieties are in progress but the results are as yet only provisional. The Canadian varieties of spring wheat, Pilot and Rival, are only slightly susceptible, even if the harvest be late, because of the good closure of the glumes. Of five hard wheats, all very late ripening, only *Triticum durum* var. *coeruleum* was fairly resistant to black rust; an emmer wheat was sufficiently resistant to merit further testing.
E.W.

1549 CHESNOKOV, P. G. [ČESNOKOV, P. G.] 633.11–2.7–1.521.6(47)
(Resistance to *Oscinosoma frit* L. of the principal standard summer wheat varieties of the U.S.S.R.)
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1946 : Nos 9–10 : 10–12.
Over 600 forms of spring wheat were tested on highly infested ground in various areas of the Soviet Union. Many of the varieties selected from the wheats of the Siberian forest steppes were relatively resistant. The most resistant group comprised Lutescens 062, Caesium 0111, Erythrospermum 0341, Milturum 162, Balaganka, Šadrinka 038 and 056, Hludovka, Lutescens 0479 and Milturum S–351. Among introduced varieties, Preston, Kitchener, Huron, Reliance 1851, Major and Bunyip were included in the resistant group.
The *Triticum durum* varieties gave different results in different areas.

1550. STOA, T. E. 633.11–2.7–1.521.6(76.4)
Rescue wheat.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1947 : **10** : 43–45.
Information is given on the performance in North Dakota of the new sawfly-resistant variety bred at the Dominion Experimental Station, Swift Current, Saskatchewan (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1053).

1551 633.11.00.14(41.5)
633.491.00.14(41.5)
Field experiments, 1946.
J. Dep. Agric. Éire 1947 : **44** : 80–90.
Spring wheat varietal trials were carried out in 1946 at 32 centres in 18 counties of Eire to compare the Swedish variety Progress and Selection No. 1, produced from a cross between Yeoman and April Red, with Atle. In general Selection No. 1 gave the least satisfactory performance. At about 20 centres Progress appeared to be a more suitable variety than Atle; it was however appreciably later in ripening.
Potato variety trials were conducted in 1946 at 58 centres to compare the variety Home Guard with Epicure and Arran Pilot. The results suggest that Home Guard is a promising early potato.

1552. 633.11.00.14(93.1)
633.11–2.484–1.521.6(93.1)
The work of other institutions.
N.Z. Wheat Rev. 1947 : No. 57 : 42–44.
At Lincoln College, varietal trials of resistance to eye spot disease are in progress.
The following field trials were carried out by the Fields Division of the New Zealand Department of Agriculture: (1) Thirteen trials were sown at various locations to compare Cross 7, Hilgendorf and WRI–Yielder; (2) Six trials were conducted in Canterbury to compare material bred by the Wheat Research Institute with Cross 7, Hilgendorf and WRI–Yielder.

OATS 633.13

1553. WILSON, A. S. B. 633.13(41)
Oat varieties.
Leafl. Dep. Agric. Scot. 1948 : No. 1 : (N.S.) : Pp. 8.
Descriptions are given of (1) the oat varieties Victory, Star, Onward, Eagle, Early Miller, Ayr Commando, Black Tartarian and the general class of potato oats, which are recommended for cultivation in Scotland as varieties suitable for milling; and (2) the varieties Yielder, Marvellous, Supreme, Golden Rain 11, Sandy and Bell, which are recommended for cultivation in Scotland only as oats for home consumption.

1554. 633.13(94.4)
633.16(94.4)
Oat and barley varieties.
Recommendations for 1948 sowing.
Agric. Gaz. N.S.W. 1948 : **59** : 25–26.
Recommendations are given for the cultivation of oats and barley varieties in the different

districts of New South Wales. Descriptive notes are included on the following oats: Algerian, Belar, Buddah, Burke, Fulghum, Gidgee, Lampton, Mulga, Sunrise, Weston and White Tartarian.

1555. Åkerman, Å. 633.13:575(48.5)
Svalöfs Orionhavre III. (01331). [**The Savlöf Orion III oat. (01331)**].
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 105–09.
A detailed description is given of the breeding of Orion III from Guldregn I x Orion II and the performance of this new black oat in tests at Svalöf and in other trials. Comparisons of yields, times of ripening and grain quality are shown for Orion III and Orion II in tables. Orion III is only a couple of days later in ripening, has a higher grain quality and yield and a stiffer straw. Orion III carries two factors for black grain, so white mutants are extremely rare and élite stocks are easily purified.
Orion III is adapted for regions in southern Norrland and along the coast where the climate is milder.

1556 Torpe, N. V. 633.13:575(48.5)
Svalöfs Primushavre II (Vrm 01466). [**The Svalöf Primus II oat (Vrm 01466)**].
Sverig. Utsädesfören. Tidskr. 1948 : **58** : 17–21.
Primus II here described (originally designated Vrm 33/34 and recorded later as Vrm 01466) is a new selection from Seger x Gopher. It has pure white grain and its yield is higher than that of Primus I and it has a lower husk percentage but weaker straw and ripens a day later It is intended to replace the old sister strain Primus I in the north-western part of Central Sweden, where a variety ripening some days earlier than Guldregn [Golden Rain] is desirable.

1557 Torssell, R. and
MacKey, J. 633.13:575(48.5)
Förädling av mellansvensk svarthavre vid Sveriges Utsädesförening. (**Breeding of Central Swedish black oats by the Swedish Seed Association**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 163–78.
The characteristics of the black oat of Central Sweden and its adaptation to the soil and other conditions of its own region are described in this detailed account of black oat breeding in Sweden from early years up to the present day.
Recent work at Ultuna tends to confirm the view that the correlation between developmental rhythm, habit, grain colour and other features of the kernel, as exhibited in progenies from white x black oats, can be largely explained by linkage.
Back-crossing of hybrids of black and white oats to black has resulted in the production of Sirius II (cf. *Plant Breeding Abstracts*, Abst. 1169, Vol. XVII), in which the typical black oat type has been combined with good grain quality. Some other promising lines have been obtained by back-crossing (1) Extra-Klock to the genuine black oats, Engelbrekt II or 01280, and (2) Sirius, Extra-Klock and a number of unnamed lines to the typical black oat Stormogul II. Stormogul II x Extra-Klock has produced a high quality line U 42/86 with extremely stiff straw and the yielding capacity of Stormogul II. Probably owing to transgression, U 42/86 and U 42/66 (from Stormogul II x Sirius) have a tendency to marked pubescence on the dorsal side of the grain: but this defect was only exhibited at Svalöf, not at Ultuna.
Some lines of one-sided oats, Sv 40/606 (from French Black one-sided oats x Sirius) and Sv 42 858 (from Engelbrekt II x French Black), seem worth further trials. On account of its earliness Sv 40/606 seems a likely competitor of Sirius II; it combines an extremely stiff straw with a higher yield than Sirius and grain only slightly inferior in quality.
Spontaneous white grained mutants from black oats could, it is thought, be used in crosses with the ordinary white oat of the Probstei type to introduce characters such as tillering capacity, resistance to drought, frit fly and grey speck, into the black oat. White grained

mutants should be easy to find, even in the most highly bred varieties of Central Swedish black oats, for such varieties in Central Sweden, in contrast to those in Northern Scandinavia, carry only one factor for black grain and its mutation frequency is 1·0–0·5 per 1000 offspring.

1558. Åkerman, Å. 633.13:575"793"(48.5)
Redogörelse för förädlingsarbeten på Svalöf med extremt tidig svarthavre. (**Report on breeding work at Svalöf with extremely early black oats**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 110–28.

The problem to be solved is the production of early black oats with a very short developmental period and capable of ripening fully even in unfavourable seasons in Norrland. The available land varieties, when bred, were too low yielding, so it was necessary to try to combine the high yield of some late ripening Swedish or foreign oats with the earliness of the land forms. Nilsson-Ehle's theory of the genetic basis requisite for such a combination is set out with observations on the occurrence of the desired characters among Swedish land varieties and on the special needs of Norrland from the standpoint of soil conditions, time of ripening as well as yield, quality, strength of straw and disease resistance.
A considerable section of the paper is devoted to a survey of oat breeding at Svalöf from 1916 to 1946 and tables are given showing (1) the characteristics and performance of very early black oats over a period of years, and (2) details of the crosses made between different varieties or strains and (*a*) Orion Nos. I. II, III, Orion c, Å 01390, Mesdag, L 01320, Sv 25/356 (the pollen parent of Same, found growing by chance among some six-rowed barley from Norrbotten) and No. 01340, and (*b*) land varieties and lines selected from land varieties. Among the most recently produced forms of early black oats are Orion III (cf. Abst. 1555) and the Same oat (cf. Abst. 496). Same has also been crossed lately with several other varieties to improve its straw strength and grain quality.
The results achieved so far in early black oat breeding are discussed and the advantage of retaining the two factors for black husk from the old, early, black varieties is mentioned as a means of keeping élite stock free from white-husked mutants.
Work is also in progress to produce very early white or yellow grained varieties.
The cross Orion II x Sirius I which is being studied at the Västernorrland Branch Station has proved quite promising and one line 01390 from this cross is characterized by high yield, strong straw and fine plump grain, will prove a dangerous competitor for Same and Orion Nos II and III.

1559 Reed, G. M. and
Stanton, T. R. and
Wilds, G. J. 633.13–2.451.2:576.16:631.521.6(73)
Reaction of oat varieties and selections to physiologic races A-30 and A-31 of loose smut.
J. Amer. Soc. Agron. 1947 : **39** : 1077–87.

Detailed information is given on the reaction of the following oats to races A–30 and A–31 of *Ustilago Avenae*: selections from Lee-Victoria and Victoria-Fulgrain crosses; varieties and selections from crosses involving Victoria, Bond and several other varieties; 11 tester varieties for oats smut; and many older varieties.

1560. 633.13–2.481–1.521.6(76 4)
Brentzel, W. E. 635.34–2.484–1.521.6(76.4)
Plant diseases new or rarely found in North Dakota.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1948 : **10** : 113–14.

The oat varieties Clinton, Benton, Bonda, Mindo and Eaton, all developed from crosses of Bond, show considerable resistance to *Helminthosporium Victoriae*. Mohawk, Bonham, Zephyr, Andrew and Shelby are also resistant.
The cabbage varieties Marion Market, Globe, All Head Select and Jersey Queen are resistant to yellows.

1561 HANSING, E. D.,
FELLOWS, H.,
JOHNSTON, C. O. and
CLAPP, A. L. 633.13–2.484:576.16:631.521.6(78.1)
Victoria blight of oats in Kansas.
Phytopathology 1948 : **38** : p. 12. (Abst.).

Cherokee, Nemaha and Clinton are recommended as oat varieties resistant to *Helminthosporium Victoriae*, smut, and the races of crown and stem rust found in Kansas.

1562. MCLAUGHLIN, J. H. 633.13–2.484–1.521.6(76.6)
Victoria blight of oats: A dangerous new plant disease.
Circ. Okla. Agric. Exp. Sta. 1948 : No. C–127 : Pp. 4.

Victoria blight (*Helminthosporium Victoriae*) was first observed in Oklahoma in 1947 All oats with the variety Victoria in their parentage are susceptible. Varieties resistant to the disease and adapted in this state include Forkedeer, Fulwin, Kanota, Red Rustproof (Texas Red), Tennex and Wintok. Bond hybrid selections, such as Benton, Bonda, Clinton, Eaton and Mindo, are also resistant but not adapted to Oklahoma.

RYE 633.14

1563. 633.14:575(43.8)
CZARNOCKA, J. 633.14–2.452–1.521.6
Żyto Puławskie wczesne i metody jego hodowli. **(Early Puławy rye and methods of breeding it).**
Bibl. Puławska 1939 : No. 20 : Pp. 29.

The aim in breeding this rye was to perfect a new type resistant to *Puccinia graminis*. An old Moravian, winter hardy local variety of rye named Hanna was the initial material. By mass selection for two years, followed by inbreeding and individual selection, the partial sterility of the variety Hanna was eliminated and did not appear in the final variety, Hanusia which was highly resistant and in 1922 was renamed Early Puławy rye.
Resistance of rye to *P. graminis* is directly related to the earliness of the rye, since the rust spores can only damage the stems slightly, if they are already lignified at the time of attack. It was found that in Early Puławy, the quality of resistance is closely connected with the weaker structure of the early plant as compared with that of later ripening varieties.
Attempts to strengthen the stems of Early Puławy rye were practically a failure, since the thin elastic quality of its straw is related biologically to its short period of vegetation. The grain of Early Puławy rye was longer than that of any other Polish variety. A constant ratio was found between the length of ear and height of straw (cf. *Plant Breeding Abstracts*, Vol. I, Abst. 520).
Garbowski, also working on ryes resistant to *P. graminis*, classed Early Puławy rye as one of the most resistant, two other highly resistant varieties being the Mikulickie and Gnodkowickie ryes. E W.

1564. 633.14:575.14:581.162.52(49.2)
MAYER, H. K. H. A. 633.14:575.125:578.08(49.2)
Iets over inteelt-proefnemingen bij rogge. **(On inbreeding experiments with rye).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) Wageningen 1944 : No. 44/4 : 15–18. (Mimeographed.).

Ever since the beginning of these experiments to improve Petkus rye, the strongest form of inbreeding has been applied. Initially, in isolating ears a start was made with the very best plants, later, for reasons set forth, with the most typical, and at the same time good plants from the most outstanding plots grown from isolated plants. Those plants of a plot that gave the most seed when isolated were always kept, with the result that, in so far as the lines were not lost for one reason or another (at first insufficient setting of seed), the degree of self-fertility has gradually increased and in certain cases practically reached the normal level.
The methods of isolation used were described and criticized, especially as regards reliability. Means have been devised to discover so far as possible any experimental mistakes

that still occur in isolating in paper bags. The phenomenon of heterosis is very useful for this. As a result of continuous inbreeding (the older lines have been inbred for over a quarter of a century) rye generally shows a slow reduction of vitality, length of straw, grain quality, and eventually in grain set. Generally, after a series of years that is not long, an inbreeding minimum is reached, after which further reduction does not generally occur. At this point the author thinks absolute homozygosity and seed constancy may have been achieved. The time necessary to reach this depends on the chance factorial composition of the plant, on the method applied, and on chance in segregating. This minimum is much higher for some varieties than for others, which makes it probable that sometimes weakness resulting from inbreeding may be entirely absent. Such cases are undoubtedly rare and none have been found. To discover such improbable combinations of factors, work would have to be done on an unusually large scale. Some lines have continued to segregate after 20 years of inbreeding.

A survey was given of morphological and other peculiarities brought to light by inbreeding, e.g. "miracle ears", bright red awns, variegated leaves, inability to form anthocyanin coupled with yellow grain (indicator rye), inability to form chlorophyll (matchsticks), polyembryony (up to four per grain), sometimes one red and another green, obviously differently inherited and easily mistaken for vegetative mutation; unusually strong or weak wax secretion, etc.

Types resistant to inbreeding have not been found, so that all inbred lines yield less than Petkus. Crossing inbred lines resulted in the F_1 in very marked heterosis, which was relatively greatest in the most weakened lines. On further multiplication this excellent crop went the usual way of degeneration and fell below the level of Petkus, as a result of self-pollination of this self-fertile line. Using "indicator-rye" as a parent showed that 75% of self-fertilization occurred in two instances. Crossing the lines most resistant to inbreeding gave even less resistance possibly because the range of material was too restricted.

F_1 plants of the most promising crosses, planted as mixtures of four, also gave no results, presumably because of self-fertilization (self-degeneration).

Replying to questions, Prof. Mayer answered that: the chance of breeding a useful self-fertile variety of rye, comparable with self-fertile wheat, barley, and oats, is slight; generally crossing two good inbred strains gives better results than crossing two bad ones; it is not possible to get enough F_1 seed for practical cultivation experiments by growing two inbred lines in adjacent rows; the explanation of the occurrence of ergot in isolated ears is not known. The disease is normally spread by flies. The suggestion that a line which continues segregating after 20 years is only viable as a heterozygote is not supported by the distribution obtained. G. J. Vervelde stated that colchicine treatment cannot be applied to fix heterosis because doubling of chromosomes of self-fertile hybrids generally results in sterile hybrids; colchicine treatment of self-sterile plants, e.g. species hybrids, causing doubling of chromosomes, usually results in self-fertile hybrids; and referred to Darlington's "Recent Advances in Cytology". Prof. Mayer stated also that there are no differences in cold hardiness between green and yellow grained ryes. C. B.

1565. POPOFF, A. [POPOV, A.] 633.14:581.48:575–181:631.557
(The largest rye grains as seed material).
Annu. Univ. Sofia V. Fac. Agron, Sylvicult. Livre 1. Agron 1939–1940 : **18** : 141–47.

A rye prone to partial sterility was used to study the difference in the yields from the largest and smallest grains. Contrary to general opinion, no degeneration was observed in the crop from the largest grains, moreover a higher yield resulted from them than from the smaller grains. The size of grain used as seed has no effect on the incidence of partial sterility. E. W.

1566. POPOFF, A. [POPOV, A.] 633.14–1.524(49.7)
(A comparison between Bulgarian and West European rye).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1941–1942 : **20** : 283–324.

Disadvantages of a Bulgarian land rye which was compared with Petkus rye were as follows: (1) considerable heterogeneity due to the number of primitive forms of the species,

(2) summer forms which were insufficiently winter hardy, if sown in winter, (3) differences in the colour of the grain, (4) lax ears, (5) thin stems producing poor resistance to lodging, (6) marked partial infertility, and (7) low yielding capacity. Important advantages, however, of the Bulgarian rye are its early ripening and high protein content. This rye also shows little tendency to germination in the ear and might therefore be used with advantage in improving the Petkus variety, as well as in breeding valuable varieties suitable to Bulgarian conditions. E. W.

1567. 633.14.00.14(48.9)

Forsøg med Rugsorter 1939–1945. (**Trials with varieties of rye 1939–45.**).

Tidsskr. Planteavl 1946 : **51** : 357–59.

Variety trials with Svalöf Staal [Steel], Svalöf Kongs [Kings], Short-strawed Petkus, Medium-tall Petkus and Livø Petkus are recorded. In addition to the yield records, it is stated that in 1942 the Swedish varieties proved the most winter hardy and Livø Petkus came next, and the two German varieties last.

Other varieties tested for short periods were Egholm Petkus, Belgisk Kaempe [Belgian Giant] and Bonderup No. 4.

MAIZE 633.15

1568. Chase, S. S. 633.15:575:576.356.52:578.08

Techniques for isolating monoploid maize plants.

Amer. J. Bot. 1947 : **34** : p. 582. (Abst.).

Techniques for the early recognition of haploids in maize are described.

1569. R....., C. 633.15:575.1:007

R. A. Emerson 1873-1947.

J. Hered. 1947 : **38** : 353, 390.

This obituary account of R. A. Emerson refers to his important contributions to the study of maize genetics.

1570. Green, J. M. 633.15:575.12(73)

Relative value of two testers for estimating top cross performance in segregating maize progenies.

J. Amer. Soc. Agron. 1948 : **40** : 45–57.

A low yielding open-pollinated strain of Reid Yellow Dent, known as Black Yellow Dent and the high yielding double cross U.S. 35 [(WF 9 x 38–11) x (Hy x R 4)] were compared for their value as top-cross tester parents. Black Yellow Dent is also susceptible to lodging, whereas U.S. 35 is resistant. F_2 plants of three single crosses, I 198 x M 14, I 198 x KB 397 and KB 397 x Ill. 4226, were selfed and top-crossed on U.S. 35 and Black Yellow Dent. The difference between the mean yields of the testers in top-crosses with the F_2 plants of the three single crosses was not significant. This result is attributed to the fact that the gametic samples of the double cross hybrid U.S. 35 that occurred in the top-crosses were of the F_2 generation, and thus approximately equal to those of the tester Black Yellow Dent in yield potentiality. The individual F_2 segregates from the single crosses, however, showed significant differences in yield when crossed with the two testers. The data obtained suggested that U.S. 35 was more satisfactory as an indicator of specific combining ability than Black Yellow Dent. Which of the two testers used gave the better estimate of general combining ability could not be determined from the available data. It is suggested that a synthetic variety consisting of lines in current use would provide the most satisfactory means of testing general combining ability of new inbred lines. It was found that Black Yellow Dent, which is susceptible to lodging, gave greater opportunity of selection for resistance to lodging among the F_2 segregates of the single crosses with which it was crossed than did the resistant hybrid U.S. 35

1571. Green, J. M. 633.15:575.12(73)

Inheritance of combining ability in maize hybrids.

J. Amer. Soc. Agron. 1948 : **40** : 58–63.

A study was made of the F_2 segregates from three parental single crosses representing inbred combinations of high x high, high x low and low x low combining ability F_2

segregates were selfed and top-crossed on two tester strains, selection at the time of selfing being carried out only for freedom from visible abnormalities, and the average performance of their top-crosses was determined. The results indicate that combining ability is a heritable character, and that a higher frequency of F_2 segregates with high combining ability may be expected from the progeny of crosses between two inbreds both with high combining ability than from crosses representing high x low and low x low combining ability. The segregation for combining ability as indicated by the range and variance of the average top-cross yields was found to be similar in three F_2 populations studied which had different average combining ability.

1572. 633.15:575.12(75.8)

Release of Dixie 18 hybrid corn (formerly GCP 6001) Pedigree (F44 x F6) x (GT112 x L578).

Mimeo. Pap. Ga Coastal Plain Exp. Sta. 1948 : No. 52 : Pp. 3.

Dixie 18, a new yellow maize hybrid has been released as the result of the co-operative investigations of the Georgia Coastal Plain Experiment Station and the United States Department of Agriculture. Its pedigree is (F44 x F6) x (GT112 x L578); it is adapted to the coastal plain of Georgia. The new hybrid is superior to Whatley in yield and standing ability and equal to it in weevil resistance.

1573. Richey, F. D. 633 15:575.12:9(73)

The lay of the corn-huckster.

J. Hered. 1948 : **39** : 11–17.

A criticism is made of the accuracy of the historical account of hybrid maize presented in the book *The Hybrid Corn Makers* by A. R. Crabb.

1574 633.15:575.22(72.81)
633.15:576.16(72)

Anderson, E. 633.15–1.524:575(73)

Field studies of Guatemalan maize.

Ann. Mo. Bot. Gdn 1947 : **34** : 433–467.

An account is given of the collection of maize samples from fields, drying floors immediately after harvesting, or from storage cribs in Guatemala. The advantage of personal contact with the cultivators in making this type of survey is stressed. The characters of the ear studied have been previously described and discussed (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1736). The data from the 30 collections made in the highlands of Guatemala are summarized in tables, charts and photographs. It has been found that the ears tend to become smaller, with smaller shanks and fewer row numbers with increasing altitude. Varietal differences were the greatest in the collection from the Quezaltenango region. Although Guatemalan maize shows great over-all variability, individual plant variability was found to be less than in any other region so far studied, including even the highly selected open-pollinated varieties of the corn belt of the United States. This is attributed to the rigid selection for ear type practised by the farmers. The common white maize grown in the Antigua region is described. It has ears of about the same size as the varieties of the corn belt, slightly enlarged at the butt, tapering gently to the tip, and commonly 14-rowed. The yellow varieties of the same region are usually fewer rowed, and with a more strongly enlarged butt.

The hypothesis put forward by P. C. Mangelsdorf and J. W. Cameron (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 1215) that Guatemala may have formed the centre of teosinte introgression is examined; the view is reached that such introgression might have taken place in western Mexico rather than in Guatemala.

The practical difficulties encountered in collecting samples of maize varieties used as popcorn and for brewing are described. It is shown that such varieties of maize may be common. One variety of popcorn is described and its distribution discussed.

The author questions the advisability of carrying out improvement work on maize in Guatemala along the lines of hybrid production in the United States; and suggests that hybrids between élite open-pollinated white varieties, obtained by interplanting and detasseling as in the production of hybrid maize, might be more suitable for Guatemala. The possible value of Guatemalan varieties in breeding in the United States is also discussed.

It is thought that these varieties may be a source of several useful characters, such as disease and insect resistance and unusual chemical composition. A systematic and comprehensive survey of these varieties is advocated.

1575. DA SILVA, M. D. 633.15:575.42:35(46.9)
Plano para a produção e distribuição de sementes "melhoradas" de milho. (Plan for the production and distribution of "improved" seeds of maize).
Rev. Agron. Lisboa 1945 : **33** : No. 2 : Pp. 11.

Questions on the organization in Portugal of mass selection of maize and on the seed production of superior lines isolated thereby are considered.

1576 RANDOLPH, L. F. and
HERNANDEZ-XOLOCOTZI, E. 633.15:576.12
The discovery of a diploid *Tripsacum* in Mexico.
Amer. J. Bot. 1947 : **34** : p. 588. (Abst.)

Diploid *Tripsacum* plants resembling *T. pilosum* are described. They are of interest in relation to the problem of the origin of maize.

1577 ROMAN, H. 633.15:576.356.4:576.37
Directed fertilization in maize.
Proc. Nat. Acad. Sci. Wash. 1948 : **34** : 36–42.

The results of crosses between normal maize plants homozygous for the sugary endosperm gene *su* used as female parents and plants homozygous for *Su* and for a segmental interchange between a supernumerary chromosome and chromosome 4 are reported and discussed. Plants of the latter type produce three kinds of male gametes having two B^4 chromosomes, one B^4 chromosome and no B^4 chromosomes, respectively. A pollen grain contains either two gametes of the second type or one of each of the first and third types depending on whether or not disjunction of the B^4 chromosomes occurs during the division of the generative nucleus (cf. *Plant Breeding Abstracts*, Vol. XVIII, No. 4). The seeds formed are thus divisible into three kinds on the basis of the chromosome sets of their embryos and endosperms. In the experiments reported here, four-fifths of the progeny resulted from fertilization involving pollen grains in which non-disjunction had occurred and in three-quarters of these it was the hyperploid gamete which united with the egg nucleus.

Similar results with plants having another interchange, *TB–9b*, are described. The frequency of normal disjunction appears to be much lower for the B^9 chromosome than for the B^4 chromosome but it is not known whether this is due to a difference in the chromosomes themselves or to a difference in the genotypes of the two parental types. The more frequent occurrence of the type of fertilization in which the deficient gamete unites with the polar nuclei to form the endosperm nucleus and the hyperploid gamete with the egg than the reverse type is termed by the author "directed fertilization". Two possible hypotheses to explain this phenomenon are being tested. One involves a particular arrangement of the gametes in the pollen grain and the other a physiological difference between the two gametes.

1578 633.15:576.356.5:575.12:576.312.35
633.15:576.356.5:581.162.4:575.12
PUNYASINGH, K. 633.15:576.356.5:576.354.4
Chromosome numbers in crosses of diploid, triploid and tetraploid maize.
Genetics 1947 : **32** : 541–54.

Tetraploid maize derived by heat treatment from inbred diploid lines was hybridized with ordinary diploid material. The chromosome numbers of the F_1 ranged from $2n = 26$ to 34. In the $2n$ x $4n$ cross there was evidence of gametic selection.

Gametic chromosome numbers of triploid maize were variable. The F_1 of crosses between diploids and triploids had chromosome numbers from $2n = 20$ to 27. The results varied according to the direction of the cross, apparently because of gametic selection in the $2n$ x $3n$ cross. The viability of seeds from the $3n$ x $2n$ cross with two or more extra chromosomes was low.

The chromosome numbers of the progeny of crosses between triploids and tetraploids varied from $2n = 29$ to 42. There was a high proportion of tetraploids and near tetraploids when the tetraploid was used as seed parent.
Selfing of triploids produced mainly aneuploids. The breeding behaviour of triploids is discussed.
The relation of chromosome number to pollen formation and seed production is considered.

1579. WHISTLER, R. L. and
WEATHERWAX, P. 633.15:581.192(77.2)
Amylose content of Indian corn starches from North, Central, and South American corns.
Cereal Chem. 1948 : **25** : 71–75.

Samples of maize collected from widely separated areas and differing considerably in kernel size and shape, colour, and type of endosperm, were found to possess amylose contents ranging from 22·2 to 28·3%, with an average of 24–25%. Starches from standard maize varieties of the corn belt showed a similiar amylose composition. Analysis of the separated horny and floury endosperms of the standard maize Indiana Hybrid 644 indicated that the amylose contents of the two types of starch are approximately the same

1580. BRUNSON, A. M.,
EARLE, F. R. and
CURTIS, J. J. 633.15:581.192:519.241.1
Interrelations among factors influencing the oil content of corn.
J. Amer. Soc. Agron. 1948 : **40** : 180–85.

Samples of maize grain from hand-pollinated ears produced by F_2 plants of crosses between inbred lines and the strain Illinois High Oil were separated by hand into endosperm, germ and bran, and each component was analysed for oil and protein. Correlation coefficients are given for 20 pairs of kernel characters.

1581. SINGLETON, W. R. 633.15:581.192:575(73)
Sucrose in the stalks of maize inbreds.
Science 1948 : **107** : p. 174.

The invert sugar, sucrose and total sugar contents of the stalks of some maize inbreds and hybrids are given. Inbred C 103 has a particularly high sucrose content.
It is suggested that the sugar content of pure lines can be increased by breeding and that it should be possible to incorporate high sugar content into commercial field maize hybrids, harvest the ears and have the sugar crop as a by-product. It appears from the results of hybridization that the gene for sugar content is recessive.

1582 KOEHLER, B. and 633.15–2.421.9–1.521.6(77.3)
BOEWE, G. H. 633.13–2.421.9–1.521.6(77.3)
***Gibberella zeae* damage in Illinois in 1946.**
Plant Dis. Reporter 1947 : **31** : 169–70. (Mimeographed).

In a breeding test in south-western Illinois, the inbred maize lines K4, Kys, L317 and Ky27 and single crosses between these inbreds were killed by *Gibberella* stalk rot. Some inbreds showed resistance and others gave an intermediate reaction.
A survey of scab infection of oats indicated that the varieties Tama, Vicland and Boone are more susceptible than Colombia, and Clinton appears to be more susceptible than most of the older varieties.

1583. ULLSTRUP, A. J. 633.15–2.482–1.521.6:578.08
An inoculation method for determining resistance in corn to *Diplodia* ear rot.
Phytopathology 1948 : **38** : p. 27. (Abst).

A method of inoculation for determining resistance in maize to *Diplodia* ear rot is described.

1584. 633.15.00.14(41.5)
Maize growing trials.
J. Dep. Agric. Éire 1947 : **44** : 68–71.

Trials of the French maize variety, Jaune Gros du Domaine, and the Dutch variety, Golden Standard, have indicated that the cultivation of this crop for grain production has little hope of success in Eire.

1585. Robinson, J. L. and
Hutchcroft, C. D. 633.15.00.14:575.12(77.7)
The 1947 Iowa corn yield test.
Bull. Ia Agric. Exp. Sta. 1948 : No. 87 : 863–915.
The results of tests on maize hybrids conducted in different districts of Iowa are summarized. Data are included on yield per acre, stand, moisture content, height of ear, lodging and dropped ears.

BARLEY 633.16

1586 633.16(51.5)
Åberg, E. 633.11(51.5)
Praktiskt värdefulla egenskaper hos tibetanskt korn och vete. (**Characteristics of practical value in Tibetan barley and wheat**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 260–72.
The barley and wheat, brought in 1935 to Sweden from Eastern Tibet by N. Smith of Uppsala University, have now been given to the Swedish Seed Association, Svalöf, for cereal breeding. This material has now been studied for (1) resistance to *Erysiphe graminis* DC., *Puccinia simplex* Eriks. et Hen. and *P. glumarum*; (2) yield and 1000 corn weight; and (3) protein content of the grain, gluten content and gluten quality. Results were very promising and the material also exhibited considerable variation in some morphological features.

1587. Miche, F. 633.16:581.142:519.24:575.113.3
Une curieuse répartition à 3 sommets. Sa signification génétique. (**A curious distribution with 3 maxima. Its genetical significance**).
Arch. Klaus-Stift. VererbForsch. 1947 : **22** : 351–56.
A genetical analysis is made of the curve obtained by W. Johannssen in which he grouped barley plants of the variety Imperial according to their percentage of aborted grains per ear and plotted the numbers of plants in each category. The three maxima of the curve can be explained as a consequence of the presence in the population of a multiple allelomorphic series of three genes, *A*, *a* and *a'*, which have a relative effect on promoting germination of 100%, 50% and 25%, respectively.

1588. Joachim, G. S. 633.16:581.162.5:575.116.1
The product method of calculating linkage from F_2 data involving semisterility; and its application to a barley translocation.
Genetics 1947 : **32** : 580–91.
Formulae are presented for calculating linkage values from F_2 data in barley where a semisterility factor is involved. Special formulae are necessary since segregation for semisterility is according to a 1 : 1 not a 3 : 1 ratio as for other characters. A study of linkage in partially sterile plants from Smith's translocation A barley stock (cf. *Plant Breeding Abstracts*, Vol. XII, Abst. 790) is reported. Partial sterility is linked with the genes *V v* for the two-rowed versus the six-rowed condition in linkage group I

1589. 633.16:581.6(73)
Industrial evaluation of Mars, Kentucky Winter and other barley varieties grown in 1945.
Publ. Malt Res. Inst. Wisconsin 1947 : No. 6 : Pp. 30.
A report is given of laboratory and commercial tests carried out by the Malt Research Institute, Madison, Wisconsin, on the malting and brewing qualities of the barley varieties Mars and Kentucky Winter, in comparison with the control variety Wisconsin Barbless. The results of laboratory tests on the malting and brewing qualities of the winter barley Reno are also reported.

1590. Lejeune, A. J. 633.16:581.6(76.4)
Montcalm barley.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1947 : **10** : 52–53.
The performance in North Dakota of the Canadian malting barley, Montcalm, is described (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 530).

1591. Barbacki, S. 633.16:581.6:575(43.8)
Dalsze badania nad dziedziczeniem i zmiennością zawartości azotu w ziarnie jęczmienia. (**Further research on the inheritance and variation of nitrogen content in the grain of barley**).
Roczn. Nauk Rol. 1947 : **49** : 267–315.

In 1926, six-rowed Himalayan barleys having naked brown-green grain of high protein content were crossed with two-rowed and with six-rowed European barleys having husked grain of low protein content. In 1932 crosses were also made between established hybrids, derived from the first crosses, and having various contents of protein. The methods used and the results of both sets of experiments are fully discussed.

The majority of the F_1 hybrids, from the above crosses, numbering 26, in all showed lower percentages of protein in the grain than the parent plants and in the remaining cases the percentages were usually intermediate between those for the parents; in the F_2 and later generations, however, Mendelian segregation occurred, showing types similar to the parents in regard to the protein content of the grain, and also intermediate and transgressive types. The number of genetic factors operating in the original hybridizations was six, estimated on the basis of the percentage of homozygotes in the F_6; in the subsequent crosses between established hybrids the number of factors was less and also varied. These factors have a cumulative effect.

The protein content was found to be partially correlated with morphological and physiological features. The two-rowed hybrids showed, on an average, a considerably higher percentage of protein than six-rowed forms with naked grain and a slightly higher percentage than the six-rowed forms with hulled grain. It is suggested that this lower protein content of six-rowed forms is due to the fact that they produce more grain in relation to straw than the two-rowed forms.

Barleys with naked brown grain were on an average richer in protein that those with green grain; moreover, forms showing grain with the darker shades of these colours were richer than forms with lighter coloured grain.

On an average higher protein contents were combined with stronger tillering capacity, greater production of straw as compared to grain, and glossy, and sometimes finer, grain; on the other hand the dimensions of the straw and of the ear were smaller, the number of spikelets less, and the yield too was lower.

Tables show that the highest yields of protein per unit area are given most often by varieties with low or medium protein content. Amongst the large numbers of hybrids produced there were no types rich in protein which also showed the higher yields, and it appears impossible to produce such types by breeding or manuring; but varieties can be bred which will have yields sufficient for fodder purposes and containing 14–15% of protein. E. W.

1592. Åberg, E. and
Wiebe, G. A. 633.16:582
Taxonomic value of characters in cultivated barley.
Tech. Bull. U.S. Dep. Agric. 1948 : No. 942 : Pp. 88.

A detailed evaluation is given of numerous characters of the growth, leaf, stem, spike and kernel in classifying six-rowed winter and spring barleys (*Hordeum vulgare*) and two-rowed spring barleys (*H. distichum*) cultivated in the United States and Canada.

1593. Smith, H. 633.16–1.524(51.5)
Om korn i Ost-tibet. (**About barley in eastern Tibet**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 273–79.

The author, who brought back interesting specimens of barley and wheat from Tibet in 1935, here describes the country from which they were obtained and its climate, soil and agriculture and also the food habits of its inhabitants.

1594. Tapke, V. F. 633.16–2.421.1–1.521.6:578.08
Barley powdery mildew (*Erysiphe graminis hordei*) influenced by environment previous to inoculation.
Phytopathology 1948 : **38** : p. 25. (Abst.)

Experiments have shown that the conditions under which barley plants are grown previous to inoculation with conidia of *E. graminis* var. *Hordei* may have a substantial effect upon

their reaction to the disease after inoculation. It is suggested that the influence of the environment before inoculation may explain divergent views on the conditions after inoculation that promote powdery mildew infection.

1595. TAPKE, V. F. 633.16–2.451.2–1.521.6:578.08
Prolonging viability of spores and mycelium of the barley loose smut, *Ustilago nuda*.
Phytopathology 1948 : **38** : p. 25.
It has been found that spores of *U. nuda* remain viable for several years when infected seeds of barley are stored at 32° F. in a refrigerator. This method of prolonging spore viability has facilitated investigation of physiological races of *U. nuda* and breeding for resistance.

1596. WATSON, J. A. and
BUTLER, F. C. 633.16–2.452–1.521.6:575.11
Resistance to barley leaf rust (*Puccinia anomala* Rost.)
Proc. Linn. Soc. N.S.W. 1947 : **72** : 379–85.
The preliminary results are reported of an investigation of the inheritance of resistance to *P. anomala* in barley.
Tests of varietal resistance are reported. The results indicate that the collections of rust used represent a physiological race unlike any of the 30 described from Europe and races 1 and 2 reported by Mains for the U.S.A.
From studies of the F_1, F_2 and F_3 generations of the cross Minn. II 21.15 (Smooth Awn x Manchuria) x No. 22 it appears that resistance to the race of *P. anomala* employed in the experiments is conditioned by two non-allelomorphic genes inherited independently. The gene found in Minn. II 21.15 is designated Pa_1 and that in No. 22, Pa_2. Pa_1 is epistatic to Pa_2. Their linkage relations are being investigated. In crosses of Smooth Awn x Manchuria with other varieties having a similar type of resistance, segregation did not occur. In crosses involving No. 22 and a variety with the Minn. II 21.15 type of resistance, however, there was segregation in all cases.

1597. VALLEJO, J. R. 633.16–2.484–1.521.6(72)
Barley scald in Mexico.
Phytopathology 1948 : **38** : p. 22. (Abst.)
Barley scald (*Rhynchosporium Secalis*) was observed in 1947 at the Chapingo station for the first time in Mexico. Among the introduced barleys, Mars, Tregal, Manchuria, Bolivia, Svansota and Texan (CI. 5127) showed no infection. The reaction of so-called native barleys ranged from a high degree of susceptibility to a fair degree of resistance.

1598. ARNY, D. C. 633.16–2.484–1.521.6:575.11
Inheritance of resistance to spot blotch of barley.
Phytopathology 1948 : **38** : p. 1. (Abst.).
The results of tests on F_2 and F_3 hybrid seedlings of barley for their reaction to *Helminthosporium sativum* suggest that reaction to this disease depends upon a single factor pair, susceptibility being dominant to resistance. No association was found between response to *H. sativum* and the colour of the lemma, colour of the pericarp, barbing of the awn, length of rachilla hairs, or reaction to stem rust. Some evidence was obtained of association between resistance to *H. sativum* and the *xantha* character of variety Colsess IV. The data from one of the crosses studied suggested an association between susceptibility to *H. sativum* and resistance to *H. gramineum*.

1599. 633.16.00.14(44)
Les résultats de l'expérimentation régionale par la Secobrah. (**The results of the regional trials by Secobrah**).
Brasserie, Paris 1947 : No. 9 : 9–19.
The results are presented of varietal tests of barley carried out in the west of France by different organizations under the co-ordination of Secobrah.*

* Society for the Promotion of the Cultivation of Malting Barleys and Hops.

1600. 633.16.00.14(44)
Résultats généraux de la culture des orges pures. (**General results of the cultivation of pure barleys**).
Brasserie, Paris 1947 : No. 11 : 8–15.
The results are presented of comparative tests of barley carried out in various parts of France during 1945.

1601. 633.16.00.14(44)
Résultats généraux de l'expérimentation régionale par la Secobrah. (**General results of the regional trials by Secobrah**).
Brasserie, Paris 1947 : No. 13 : 10–11.
The results are given of varietal tests of barley organized by Secobrah* and other organizations in different parts of France.

1602. 633.16.00.14:575.12(44)
633.16:575.113
Les travaux de la station de sélection de Maule en 1945. (**The work of the selection station at Maule in 1945**).
Brasserie, Paris 1946 : No. 3 : 6–16.
Various barley hybrids in the F_9, F_{11} and F_{12} generations have become quite fixed. Some of them are undergoing comparative tests. Other hybrids in the F_7 generation are still segregating. The crosses Sarah x Kenia 2, the reciprocal cross, René Guillemart x Mullers Neuzucht, the reciprocal of this cross, and Plumage-Archer x Bethge XIII have been successfully achieved. In the last mentioned hybrid the factor *erectum* is dominant to *nutans*. The factor *pilosum* of Sarah is recessive. Several other F_1 hybrids have also been obtained and will be used in further breeding work.
Comparative tests of varieties and hybrids of both spring and winter barley are reported

1603. 633.16.00.14:631.8(44)
Les travaux de la station de sélection de Maule en 1945. (**The work of the Maule Selection Station in 1945**).
Brasserie, Paris 1947 : No. 6 : 7–15.
The reactions of different barley varieties to nitrogen manuring are compared.

MILLETS AND SORGHUM 633.17

1604. Iyengar, K. G.,
Dorasami, L. S. and
Iyengar, R. S. 633.171:575.42(54)
Ragi (*Eleusine coracana* Gaertn.)
Mysore Agric. J. 1945–46 : **24** : 33–49.
An account is given of *Eleusine coracana*, with reference to the synonyms and vernacular names of the species, the history of its cultivation in various countries, present day cultivation and production in Mysore and other regions of India, chemical composition and uses, genetical investigations in India, the classification of varieties, economic characters, and improved varieties now cultivated in India.

1605. Karper, R. E. and
Quinby, J. R. 633.174(73)
Sorghum—its production, utilization and breeding.
Econ. Bot. 1947 : **1** : 355–71.
A general account of sorghum is given, with reference to its botanical characteristics, and the production, cultivation, utilization, varieties, and past achievements and present objectives of breeding in the United States.

1606. Spooner, H. A. 633.174:575.127.2:633.282(76.4)
Sweet Sudan makes sweet gains!
Sth. Seedsman 1948 : **11** : No. 3 : 33, 52.
An account is given of the increasing use of Sweet Sudan grass, developed in Texas by R. E.

* Society for the Promotion of the Cultivation of Malting Barleys and Hops.

Karper and J. R. Quinby from a cross between common sudan grass and the sweet sorghum variety Leoti (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 1261, XVI, Abst. 617).

1607. Leukel, R. W. and Johnson, A. G. 633.174–2.484–1.521.6:578.08
Periconia circinata, the cause of milo disease.
Science 1948 : **107** : 93–94.

Experiments have shown that milo disease is caused by a fungus, *P. circinata* (Mang.) Sacc. The use of steam-sterilized soil inoculated with this fungus affords plant breeders a more satisfactory method of testing selections for resistance to milo disease than was available before the discovery of the causal organism.

RICE 633.18

1608. 633.18
Report of the Rice Study Group, Trivandrum, Travancore State, India 16 May–6 June 1947.
F.A.O. Washington 1947 : Pp. 58.

The report of the Rice Study Group of the F.A.O. deals with the international and national problems of rice production under the following chapter headings: need for international action; production trends and potentialities; conservation of available supplies; consumption and nutrition; improvements and expansion of production; improvements in domestic marketing and distribution; price policies; international trade in rice; research and extension; and exchange of information. The following appendices are also included: members of the Rice Study Group; forward estimates of requirements and supply of rice from South and East Asia, 1952; table of weights and measures for rice; international reserve stocks; a note on assurance of long-term markets; supplementary information; and statements by delegations.

The chapter on improvements in domestic marketing and distribution includes sections on the classification of rice varieties and grading. The undesirability of an unnecessarily large number of rice varieties is emphasized. The chapter dealing with research and extension includes the recommendations that (1) rice research should be undertaken on an international basis and should include studies on cultural practices, irrigation, breeding and other problems; (2) a system of exchange of knowledge on selection and hybridization should be established; and (3) any international rice organization should disseminate information on the availability of improved seed supplies, and collect, maintain and exchange seeds of new varieties and of old indigenous varieties with a view to facilitating further improvement by breeding.

1609. Niles, J. J. 633.18(54.8)
Paddy cultivation in the Jaffna peninsula.
Trop. Agriculturist 1946 : **102** : 226–31.

Information is included on the rice varieties cultivated in the Jaffna peninsula, Ceylon.

1610. 633.18:575(45)
Precoce Bellardone. (**Early Bellardone**).
Risicoltura 1942 : **32** : 86–87.

This new rice variety is a selection from Precoce Allorio made in 1938 by the brothers Bellardone. It is equal to the parent variety in earliness and is highly resistant to diseases, shorter and more resistant to lodging and shedding than Americano 1600, which it exceeds also in size of grain.

1611. Chiappelli, R. 633.18:575(45)
Prove di orientamento dei risi: "Sesia", "Sen. Novelli" e "Stirpe 136".
(**Preliminary tests of the rice varieties Sesia, Senatore Novelli and Strain 136**).
Risicoltura 1942 : **32** : 7–8.

The varieties Sesia and Novelli both have exceedingly long grain classed as superfine, and, given suitable soil and other conditions, have yielded up to 80 quintals of grain per hectare; both varieties prefer a clay soil.

Strain 136 (cf. Abst. 953) is distinguished by resistance to lodging, shedding and disease and is almost equal to Americano 1600 in yield, its grain being classed as semi-fine.

1612. 633.18:575(45)
Relazione sul concorso selezione sementi riso 1941. (**Report on the 1941 rice selection competition**).
Risicoltura 1942 : **32** : 21–29.
In the 1941 competition, specimens were sent in by 180 different cultivators. The common varieties like Americano 1600 were the most frequent but certain new varieties created by growers were also represented, also some new varieties produced by the Vercelli rice research station. These included No. 16, distinguished by high standing capacity and Stirpe 537 [Strain 537], a variety with exceptionally large grains, with a 1000 grain weight of 52 grm.

1613. CHIAPPELLI, R. 633.18:575(45)
Le varietà di riso nell' attuale periodo di guerra. (**The rice varieties in the present war period**).
Risicoltura 1943 : **33** : 6–7.
The merits of the different Italian rice varieties are discussed, with notes on the particular conditions for which each is most suited. Special mention is made of Stirpe 136 [Strain 136], which is exceptionally resistant to lodging, shedding and diseases and under good conditions yields as well as Americano 1600. Sesia has exceedingly large, fine grain, has yielded over 80 quintals per ha. and proved resistant to both lodging and diseases.

1614. CHIAPPELLI, R. 633.18:575(45)
Le nuove varietà di riso al Campo Sperimentale. (**The new varieties of rice in the Experimental Field**).
Risicoltura 1944 : **34** : 58–66.
Senatore Novelli is the result of a natural cross between Lady Wright and Chinese Ostiglia. First obtained in 1936 at the same time as the well-known variety Sesia, it could not be maintained in a pure state and was abandoned. A vigorous selection of pure lines has now resulted in a variety with better characteristics. It is slightly taller than Sesia but equally if not more resistant to lodging. It is resistant to disease and as early as Sesia.
Adelaide Chiappelli is from the cross Lady Wright and Nero Vialone. It has a large and heavy grain inferior only to Line 537. It is awnless and the plant is slightly shorter than Americano, with a height of 96–84 cm. and 8–10 tillers. R. M. I.

1615. PIACCO, R. 633.18:575(45)
Le varietà di riso coltivate in Italia. (**Varieties of rice cultivated in Italy**).
Risicoltura 1943 : **33** : 189–96; 1944 : **34** : 9–20, 35–42, 85–96, 129–44.
Observations were made in 1943 on 29 of the best Italian rice varieties. Details are given regarding the soil, treatment, and climatic conditions under which the plants were grown. Studies on the vegetative cycle were made by sowing on 11 April and on three later dates in May. The earliest variety to mature was Bertone (138 days) and the latest Americano (175 days); delay in sowing did not produce an equivalent delay in the date of maturity. The height and amount of tillering in Italian varieties are studied in the third section. The conditions of development have a decisive influence on the ultimate height of the plant. Five main groups are distinguished ranging from high, 135–144 cm. in Vialone and Battezzato, to very low, 95–104 cm. in Ardito. Under ideal conditions, tillering varied in different varieties from a maximum of 11·9 culms to a minimum of 7·2.
In the fourth section the author investigates in detail the characteristics of the inflorescence, particularly in the five varieties Americano, P.6, Maratelli, Allorio and Sesia, as a preliminary to a wider study.
The fifth section is a detailed study of the spikelet and the characteristics which can be used in classification.

1616. LAVALLARD, M. L. 633.18:575(76.7)
"Rexark": new rice field aristocrat.
Sth. Seedsman 1948 : **11** : No. **3** : 15, 54.
The new rice variety Rexark, developed from a cross between Rexoro and Supreme Blue Rose, has been released by the Arkansas Agricultural Experiment Station. It gives consistently high yields of long slender grain, which thresh easily with little shattering and give a milled rice of excellent quality. Rexark is medium in maturity, resistant to *Cercospora* leaf spot and white tip, and susceptible to black sheath rot and stem rot. The straw is short and stiff.

1617. CHIAPPELLI, R. 633.18:575.42(45)
La selezione del riso. (**Selection of rice**).
Risicoltura 1943 : **33** : 85–86.
Some notes are presented for would-be participators in the Italian national rice breeding competitions.

1618. BORASIO, L. 633.18:576.16
Il riso nella storia e nella leggenda. (**Rice in history and legend**).
Risicoltura 1943 : **33** : 181–85.
The history of rice cultivation is traced from its origin in China, its introduction into India and thence through the near East to the Mediterranean basin. Reference is made to letters of the Duke of Milan dated 1475 in which rice cultivation in Italy is mentioned.

1619. PIACCO, R. 633.18:581.46(45)
Le varietà di riso coltivate in Italia. (**The varieties of rice cultivated in Italy**).
Risicoltura 1944 : **34** : 85–96.
In the fourth section, the author investigates in detail the characteristics of the inflorescence, particularly in the five varieties, Americano, P.6, Maratelli, Allorio and Sesia, as a preliminary to a wider study. R. M. I.

1620. PU, M. H. 633.18:581.48:578.08(51)
(**Grain shedding of rice**).
Nung Pao 1942 : **7** : 470–73.
The shedding of grain during the harvesting of rice constitutes an important loss. Investigations have been carried out to determine the susceptibility to shedding of the different rice varieties and to supply data for breeding work. The experiments included 98 strains of *Oryza sativa* var. *indica* and 31 of *O. sativa* var. *japonica*. Twenty ripe ears of each strain were collected, dried and allowed to fall three times from a height of five feet. The percentages of grains which dropped off were determined and analysed statistically. All the strains of var. *indica* showed more than 20% of grain drop, and all the high yielding varieties more than 50%. All the strains of var. *japonica* from the southwestern provinces showed less than 20% grain drop and those of the lower Yangtze Valley approximately 30%. The results are discussed in relation to harvesting by hand and machine, and future possibilities of breeding for less grain shedding. H. C. Y.

1621. SANJIVA RAO, B. 633.18:581.6(54)
Technology of rice.
Curr. Sci. 1948 : **17** : 13–15.
This article is an abstract of the presidential address delivered by the author to the Chemistry Section of the Indian Science Congress, January, 1948. Mention is made of extensive investigations conducted by the Central College, Bangalore, to correlate varietal differences in the physical properties of the rice grain with quality. In general it has been found that the grain of varieties with superior quality has a greater permeability to moisture, such varieties losing water more rapidly during dehydration and absorbing water at a faster rate during hydration than varieties of poorer quality. Other physical properties have not shown any valuable correlation with quality.

1622. Ryker, T. C. and
Cowart, L. E. 633.18–2.484:576.16:631.521.6:575(73)
Development of *Cercospora*-resistant strains of rice.
Phytopathology 1948 : **38** : p. 123. (Abst.).

In breeding for resistance to *C. Oryzae* it is necessary to consider the pathogenicity of different races. Eight races have been identified by the differential reaction of Blue Rose, Blue Rose 41, Caloro, Fortuna, Red Rice, Rexoro and Nira. Two additional races have been identified, race 9, to which Shoemed, Blue Rose, Fortuna and Nira are susceptible, and race 10, which is similar to race 2 except that it attacks Caloro as well as Blue Rose and Blue Rose 41. Investigations on the inheritance of reaction to race 6 indicated a single dominant factor for resistance in two crosses.

All the commercial varieties used in rice breeding are susceptible to one or more races, but it has been possible to combine the factors for resistance to all races by hybridization. Delrex, a recently released variety bred from a cross between Rexoro and Delitus, and a number of advanced selections from crosses between Rexoro and Blue Rose, are resistant to all known races of the disease.

FORAGE GRASSES 633.2

1623. Whyte, R. O. 633.2/3(56.4)
The fodder resources of Cyprus. A report of a survey made in autumn, 1945 and spring, 1946.
Nicosia 1948 : Pp. 44.

A report of the recent survey of the fodder resources of Cyprus is presented under the following sections: the environment; natural vegetation; types of land use; fodder resources and potentialities of the land-use types; the conserving capacity of vegetation; animal husbandry, health and breeding; types of fodder; chemical composition and nutritive value; varietal adaptation and plant introduction; other winter-rainfall problems and techniques; views on land use in Cyprus; and summary and recommendations.

1624. Saxby, S. H. 633.2/3(93.1)
Pasture production in New Zealand.
Bull. N.Z. Dep. Agric. 1946 : No. 250 : Pp. 126.

Parts 1 and 2 of this bulletin give notes on the uses of approximately 70 grass and legume species, reference being made in some cases to different strains. Part 3 deals with problems of pasture management.

1625. Sullivan, J. T. and
Garber, R. J. 633.2/3:581.192
Chemical composition of pasture plants.
Bull. Pa Agric. Exp. Sta. 1947 : No. 489 : Pp. 61.

The bulletin reviews information on the chemical composition of pasture plants, with reference to the requirements of livestock; a section is included on interspecific and clonal differences in composition.

1626. Holmes, G. A. 633.2/3–1.531.12
Self-sufficiency in seed of adapted strains.
J. Brit. Grassland Soc. 1948 : **3** : 43–45.

The present trend in Great Britain of self-sufficiency in seed supplies of clovers and grasses and the disproportionately heavy use among British farmers of the short-lasting legumes, such as trefoil and alsike are criticized on agricultural and economic grounds, reference being made to the seed supplies of suitable grass and clover strains which could be imported from New Zealand.

1627. Evans, G. 633.2/3–1.531.12(41+42)
Needs and supplies of seeds of adapted strains.
J. Brit. Grassland Soc. 1948 : **3** : 35–42.

The general development in different countries towards self-sufficiency in the seed production of adapted grass and clover strains is analysed, and notes are given on the present situation as regards seed supplies in New Zealand, North America and European countries. The problems of certified seed production of adapted grass and clover strains in Great

Britain are discussed, present production being unable to meet the total requirements of authenticated seed. The view is expressed that Great Britain could be self-supporting in all the seed of grasses that are essential to its agriculture, with increased acreage of seed crops. It is suggested that cold storage of surplus clover seed obtained in good harvest years on an increased acreage would overcome the problem of irregulatiry in the seed production of clover, and would be a more valuable practice than export in years of surplus or the import of inferior foreign strains in years of deficient seed supply.

1628. 633.2:575:35(46.9)
633.3:575:35(46.9)
PIRES, D. R. V. 633.1:575:35(46.9)
Aspectos portugueses do melhoramento de plantas. (**Portuguese aspects of the improvement of plants**).
Rev. Agron. Lisboa 1945 : **33** : No. **2** : Pp. 8.

It is recommended that plant breeding in Portugal should be accomplished by a central breeding station and a chain of subsidiary testing stations, since there is in Portugal a very great diversity of soil and climate. Breeding work is largely concerned in obtaining locally adapted strains of forage crops. The following are being studied: *Trifolium incarnatum, T. alexandrinum, T. repens, T. pratense, Vicia, Lathyrus, Melilotus, Lolium perenne, Phalaris tuberosa, Ph. arundinacea, Dactylis glomerata, Bromus inermis, Sanguisorba minor, Medicago sativa, M. media, Hedysarum coronarium* and *Onobrychis sativa.* Extensive work on the hybridization of wheat varieties to obtain locally adapted forms is in progress. Barley and oats are also being improved.

1629. TRAVIN, I. S. and 633.2:575.12
ŠČERBAČEVA, V. D. 633.321:575.12
(Natural unrestricted intervarietal hybridization of red clover and grasses).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : Nos. **11–12** : **51–55.**

It has been found by the authors at the Institute of Fodders that when two, or not more than a few, well selected varieties of grass or red clover are spatially isolated and grown in recurrent rows, and left freely to pollinate one another, the yield of the progeny is usually higher than that of the original varieties. There is no advantage in using a large number of varieties, or in artificial hybridization between pairs of selected plants. The best results are believed to be obtained when the species used have a long history of cultivation and include many long established varieties, e.g. red clover and timothy. There is no evidence, after the improved variety has been propagated for some time, of a falling off in the yield.

I. Z.

1630. SPRAGUE, V. G. 633.2:581.145.1:581.02(74.8)
The relation of supplementary light and soil fertility to heading in the greenhouse of several perennial forage grasses.
J. Amer. Soc. Agron. 1948 : **40** : 144–54.

Experiments were carried out at the State College, Pennsylvania, to determine the environmental conditions, particularly supplementary light, required to induce heading in the greenhouse during the winter months, with a view to facilitating breeding investigations. The following species were studied: *Dactylis glomerata, Lolium perenne, Phleum pratense, Festuca elatior* and *Bromus inermis.*

1631 GEISLER, F. 633.2:581.331.2
A study of pollen grains of thirty-two species of grasses.
Butler Univ. Bot. Studies 1945 : **7** : 65–73.

A study is presented of the pollen characters, especially size, of 32 grass species from four types of habitat. The results do not make possible the identification of genera according to their pollen characters. They indicate however that prairie conditions can hardly be associated with grasses of which the modal peak for pollen size-frequency is between 19 and 39 microns.

1632. Jones, M. D. and Newell, L. C. 633.2–1.531.12:581.162.32(78.2)
Size, variability, and identification of grass pollen.
J. Amer. Soc. Agron. 1948 : **40** : 136–43.

Studies of pollen identification and dispersal were carried out on 40 grasses at the Nebraska Agricultural Experiment Station during 1944 and 1945, in relation to the problems of producing and maintaining pure seed stocks of cross-pollinated species. The ability of different grasses to produce pollen was found to vary considerably; such species as *Bromus inermis, Phleum pratense, Secale cereale, Elymus junceus, Dactylis glomerata, Poa pratensis* and *Zea Mays* were prolific producers of pollen. Shape and natural colour appear to be of little value in pollen identification. On the basis of pollen size as shown by data on diameters the 40 grasses studied could be grouped into five classes. But the identification of pollen on the basis of size only is difficult on account of the overlapping shown by the five groups. In some grasses environmental conditions exert a marked effect upon pollen size, as revealed by a comparison of the data for the two different years. Knowledge of the season and time of day of pollen shedding is also necessary in studying pollen dispersal of grasses. Finally, it was found that in general the greater proportion of the pollen fell to the ground, in contrast to the common belief that the pollen is widely disseminated. The presence of even small amounts of pollen in the atmosphere, however, adds to the problems of securing the necessary isolation for the maintenance of pure seed stocks

1633. Christoff, M. A. [Hristov, M. A.] 633.21:581.163:576.356.5:581.481
(Embryological studies of the reproduction of some species of *Poa*).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1. Agron. 1941—1942 : **20** : 169–87.

P. alpina ($2n = 14$), *P. trivialis* ($2n = 15$), *P. compressa* ($2n = 49$) and *P. pratensis* ($2n = 63$) were chosen for the study of the causes of apomictic reproduction.

Examination of the chromosome number in the root tips of *P. compressa* suggested the occurrence of apomixis which was confirmed by embryological investigation.

The uniform progeny observed in the apomictic plants of this genus may be due to aposporic or sporophytic development, and the latter may be a case of nucellar embryony of secondary origin. The triploids, like the progeny with varied chromosome number, are attributed to fusion of the nucleus of the egg cell in an aposporic embryo sac with the unreduced pollen nucleus. The occurrence of tetraploid twins and of tetraploid progeny of an apomictic diploid suggest that in *Poa*, embryos of endospermic origin are formed.

In *P. compressa*, the chromosomes in some of the endosperm cells, being greatly contracted, were found to differ in size and shape from the chromosomes of neighbouring cells in the heterotype metaphase of cells which have undergone a "double chromosome reproduction" (according to Gentscheff and Gustafsson's terminology). The possible relation of this phenomenon to polyploidy in *Poa* must remain a matter for investigation. E. W.

1634 Christoff, M. A. [Hristov, M. A.] 633.21:581.163:576.356.5:581.481
(Polyploidy, apomictic seed formation and polyembryony in *Poa* species).
Annu. Univ. Sofia Fac. Agron. Sylvicult, Livre 1. Agron. 1942–1943 : **21** : 221–36.

On the basis of the chromosome numbers determined for 17 forms, belonging to 13 different species, and of determinations made by other workers, the author establishes for *Poa* the following polyploid series with the basic number $x = 7$, $2n = 14$, 21, 28, 35, 42, 49, 56, 63 and 70.

Polyploid races are also established for forms of individual species, e.g. *P. alpina*, $2n = 14$, 22, 28, 32, 34, 37 and 42; *P. pratensis*, $2n = 28$, 49, 56, 63, 70 and 91; and *P. compressa*, $2n = 35$, 42, 49 and 56.

Embryological studies show that *P. alpina* ($2n = 14$) and *P. trivialis* ($2n = 15$) reproduce sexually. *P. trivialis* exhibits low fertility due to irregular meiotic division. *P. pratensis* and *P. compressa* reproduce apomictically.

An ovule of *P. pratensis* was found to contain two embryos in one embryo sac, one normal

and one of endosperm origin. The formation of more than one embryo sac occurs often in *P. pratensis* and *P. compressa.*

In germination experiments with *P. pratensis*, twin seedlings were obtained. The percentages of twins in the forms No. 4 and No. 7 were respectively 4·4 and 13·0 in 1941, and 47·4 and 11·9 in 1942. Examination of the chromosome numbers of the twin plants showed that (*a*) the formation of an aposporic and a sporogenic embryo sac may occur in the same ovule; (*b*) fertilization of the egg cell is possible both in the normal and in the aposporic embryo sac; and (*c*) the haploid twin seedlings observed are regarded as a result of haploid parthenogenesis occurring in the normal embryo sac, and many of the diploid twin seedlings as a result of diploid parthenogenesis in an aposporic embryo sac.

1635. Keck, D. D. 633.21:581.163:576.356.5:582
The taxonomy of *Poa* in the Pacific states.
Amer. J. Bot. 1947 : **34** : p. 607. (Abst.).

A revision of the taxonomy of the genus *Poa* is called for in order to accommodate new evidence concerning apomixis, polyploidy and ecological races.

1636. Christoff, M. A. [Hristov, M. A.] 633.21:581.163:581.481:575.22
(**Polyembryony as a cause of variability in the apomictic species of the genus *Poa*).**
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1943–1944 : **22** : 153–78.

The twin plants in the progeny of two forms, P_4 and P_7 of *P. pratensis* var. *angustifolia* were studied.

Caryotypic investigations showed that in the case of most of the twins in P_4 and of all in P_7 the first-developed twin plants retain the chromosome number of the mother plant, whereas most of the later developed twins have aberrant chromosome numbers.

Amongst the twin plants of P_4 are many haploids with $2n = 31$ or $2n = 32$ chromosomes which are considered to be the results of parthenogenesis in the legitimate embryo sac. The origins of the triploid twin plants with $2n = 95$, $2n = 70$ and $2n = 77$, of the triploid variants $2n = 87$, $2n = 81$ and $2n = 86$, and of the tetraploid twin plant with $2n = 98$ are discussed. In P_7 there are no haploid twin plants.

Studies were also made of the plants as regards their height and the breadth of their leaves. Decrease in the number of stomata accompanied increase in size of the epidermal cells and of the stomata.

A detailed description is given of the course of meiosis and of the development of the embryo sac, as observed in the case of haploid twin plants with $2n = 31$ and $2n = 32$, and of triploid twin plants with $2n = 81$ and $2n = 86$. E. W.

1637. Butters, F. K. and
Abbe, E. C. 633.21:582:575.127.2(77.6)
The genus *Poa* in Cook County, Minnesota.
Rhodora 1947 : **49** : 1–21.

One new species, *P. scopulorum*, and one putative hybrid, *P. tormentuosa*, supposed to be a cross between *P. glauca* and *P. nemoralis*, are described from Minnesota.

1638. Magrou, J. 633.21–2.4–1.521.6:581.143.26
Adaptation du *Poa annua* L. aux hautes altitudes dans les Pyrénées centrales. (**Adaptation of *P. annua* L. to the high altitudes of the central Pyrenees**).
Bull. Soc. Bot. Fr. 1947 : **94** : 317–19.

The form of *P. annua* which grows at high altitudes in the Pyrenees is perennial and has mycorrhizal roots. It appears to maintain its peculiarities at low altitude if it is grown in its accustomed soil.

1639. Julén, G. 633.24:575(48.5)
Svalöfs Omniatimotej. Ny, högt avkastande timotejsort med vidsträckt odlingsområde. (**Svalöf Omnia timothy. A new high yielding timothy variety with a wide possible range of cultivation**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 291–99.

The new strain, formerly known as Sv 0812, is derived from plant No. 696, raised in 1906 in

a lot of commercial seed from Önnestad in eastern Skåne. This plant was relatively highly self-fertile; its progeny showed little ill-effect after inbreeding and gave rise to an F_1 inbred in which the mother plant of Omnia was found with the same high degree of self-fertility and resistance to degeneration due to inbreeding.
Omnia, put on the market in spring 1947, has an erect habit and good tillering capacity, broad, long, slack leaves, fairly long but stiff stems, a long dense head and good seed setting capacity. Emergence occurs one day or a few days later than in Gloria.
Its performance in variety trials at Svalöf and at the branch stations of the Swedish Seed Association is recorded. Studies of recovery capacity are not yet complete. The variety Vanadis is superior in that respect, but not sufficiently so to compensate for its lower yield at the first cut, as compared with Omnia.

1640 633.24.00.14(48.5)

JULÉN, G. 633.24–1.524(48.5)

Smärre meddelanden och referat. (**Short communications and reviews**).

Sverig. Utsädesfören. Tidskr. 1947 : **57** : 528–36.

LUNDBLAD, K.

Bemötande av lic. G. Juléns anmälan om Jordbruksförsöksanstaltens Meddelande nr 19. (**Reply to licentiate G. Juléns' review of "Jordbruksförsöksanstaltens Meddelande No. 19"**)

Ibid. 1947 : **57** : 536–45.

The first paper contains a highly critical review of the 1941–46 timothy trials, reported upon by the Agricultural Research Institute [Jordbruksförsöksanstalt] (cf. Abst. 1641). In the second article K. Lundblad justifies his report by replying point by point to the objections.
Adequate English summaries are provided for both articles.

1641. 633.24.00.14(48.5)

LUNDBLAD, K. 633.24–1.524(48.5)

Timotejstammar. Resultat från en serie försök åren 1941–1946. (**Strains of timothy. Results from a series of field trials conducted in the years 1941 to 1946**).

Medd. Lantbrukshögskolan Jordbruksförsöksanstalten, Norrtälje 1947 : No. 19 : Pp. 31.

Principles of timothy breeding and previous work in Sweden are outlined with comments on trials and the selection of strains, on the origin and chromosome number of *Phleum pratense* L. and *P. nodosum* L. and on the way in which local strains have originated.
In Sweden timothy is the main constituent of grassland used for hay. There are (1) many local strains long cultivated and thus well adapted to local conditions and climate, (2) some commercial strains, improved and put on the market by Swedish plant breeding institutes. The object of the 1941–46 trials was to discover the strains best suited for different parts of the country. The author states that the conclusions may be regarded as tentative as the number of tests was rather small.
The performance and value for cultivation in various parts of Sweden are examined with reference to the following commercial and other strains; Kämpe II [Champion II] from Weibullsholm, Bottnia (from Svalöf), Svalöfs Gloria and Bore II. Incidentally it is mentioned that an élite of Bottnia, Bottnia K.V.B.A., raised for seed at Brännberg Experimental Farm was far superior to the common Bottnia, where they were tried together. The oldest known local strain, Kolja, grown at the Kolja Farm in Rinkaby for the last 70 years, was tried at several places in southern and central Sweden and proved equal or superior to the commercial and local strains of the districts.
Other good local strains were found in the provinces enumerated, e.g., Berg and Slättängen from Alvsborg, Mejstad and Hula from Kalmar, Söderby from Södermanland, Bränninge from Stockholm county, Gimo from Uppsala, Flärke and Nordanåker from Västernorrland, Stöcksjö from Västerbotten and Nybyn from Norrbotten.
Farmers are advised to retain the good local strains they possess unless several years of trials happen to prove their own strains to be inferior.

1642. Böcher, T. W. 633.264:576.312.35(48.9)
Festuca polesica Zapal., its chromosome number and occurrence in Denmark.
Bot. Notiser 1947 : 353–60.
Notes are presented on the ecology and distribution of *F. polesica*. Its chromosome number is $2n = 14$.

1643. Webster, C. B. 633.287–2.112–1.521.6(73)
Slender grama is here to stay.
Sth. Seedsman 1948 : **11** : No. 2 : 24, 28.
Seed of slender grama (*Bouteloua filiformis*) originating from the foundation seed of accession T–3451 is commercially available. This accession was derived from the best plants of accession T–901, which was collected in Texas. Attention is drawn to the drought resistance and ability to withstand severe competition of slender grama. The grass is recommended for the dry southwestern ranges of the United States.

1644. Senn, H. A.,
Heimburger, M. L. and
Moore, R. J. 633.289:576.356.5:582(71)
The cytotaxonomy of Canadian species of _Agropyron_.
Amer. J. Bot. 1947 : **34** : p. 607.
Polyploidy is reported in *Agropyron* species in various populations in Canada.

1645. Gould, F. W. 633.289:582:001.4
Nomenclatorial changes in _Elymus_ with a key to the Californian species.
Madroño 1947 : **9** : 120–28.
Prefacing his key to the Californian species of *Elymus* by a short taxonomic review, the author gives his reasons for deciding to include all the Californian representatives of the genera *Agropyron, Sitanion* and *Hystrix* in *Elymus*.

LEGUMINOUS FORAGE PLANTS 633.3

1646. 633.31–2.112–1.521.6(47)
Markova, K. V. 633.31:581.6:575(47)
(Carotene contents in fodder of southern Kazahstan).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1946 : Nos 7–8 : 9–13.
The lucerne varieties, Blue Turkestan and Yellow Dagestan, resisted drought and were richest in carotene. This should be noted if lucerne breeding is undertaken.

1647. Smith, D. 633.31–2.411.4–1.521.6(77.5)
The reaction of strains and varieties of alfalfa to seedling infection by downy mildew.
J. Amer. Soc. Agron. 1948 : **40** : 189–90.
Observations are given on the incidence of *Peronospora Trifoliorum* upon 17 strains and four varieties of lucerne grown at the Wisconsin Agricultural Experiment Station in 1947. Strains C–35, C–130, A–214–Syn. 1, and the variety Grimm proved the least susceptible.

1648. Fenne, S. B. and
Henderson, R. G. 633.31–2.421.6–1.521.6(75.5)
Unusual weather causes severe stem-rot injury on alfalfa and clover in Virginia.
Plant Dis. Reporter 1947 : **31** : p. 214. (Mimeographed).
Williamsburg, a new strain of lucerne developed by the Virginia Experiment Station appears to show some resistance to stem rot caused by *Sclerotinia Trifoliorum*. It produced thicker and greener stands than other strains.

1649. TYSDAL, H. M. 633.31.00.14(73)
Report of the Uniform Alfalfa Nurseries. 1946.
U.S. Dep. Agric.; Agric. Res. Admin.; Bur. Pl. Industr. Soils and Agric. Engin. Beltsville, Md 1946 : Pp. 48. (Mimeographed).
The tenth annual report of the Uniform Alfalfa Nurseries tabulates the results of the 1946 tests on a large number of varieties and strains, including polycross strains. Data were received from twelve States.

1650. TYSDAL, H. M. 633.31.00.14(73)
Report of the Uniform Alfalfa Nurseries, 1947.
U.S. Dep. Agric.; Agric. Res. Admin.; Bur. Pl. Industr. Soils and Agric. Engin.; Beltsville, Md 1947 ; Pp. 114. (Mimeographed).
The eleventh annual report of the Uniform Alfalfa Nurseries tabulates the data received from 21 co-operating states on the 1947 tests of varieties and strains, including polycross strains. A list gives the history and origin of the strains which have been entered in the tests since 1945, viz., A–221 to A–226, and C162 to C254. Details of strains entered in the testing programme previous to 1945 are to be found in the ninth annual report and its supplements (cf. Abst. 253).

1651. JULÉN, G. 633.32:581.4:575.12
En abnorm form av alsikeklöver (*Trifolium hybridum*). [**An abnormal form of alsike clover (*T. hybridum*)**].
Bot. Notiser 1945 : 72–74.
An aberrant plant *T. hybridum* characterized by deformed leaves and flowers is described. It arose from the cross Ötofte x (Ötofte x Svea).

1652. ÅKERBERG, E.,
BINGEFORS, S. and 633.321:575(48.5)
LESINS, K. 633.31:575(48.5)
Några aktuella problem inom förädlingen med rödklöver och lusern för Mellansverige. (**Some current problems in the breeding of red clover and alfalfa for Central Sweden**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 200–29.
Though the breeding programme of the Ultuna Branch Station of the Swedish Seed Association has included work on grasses, clover and lucerne, the present report deals only with the last two crops. Experience of the effect of natural selection in the formation of well adapted local strains of red clovers in Sweden has proved that local breeding work is especially necessary in the case of legumes. One of the main problems is to obtain red clover strains resistant to *Sclerotinia Trifoliorum* and *Ditylenchus dipsaci* and retaining the good features of the best local forms, including adequate hardiness for the regions to which they are adapted. Experiments have shown that the Central Swedish, local diploid and tetraploid strains are superior to southern Swedish forms in resistance to unfavourable winter or spring conditions.
The necessary techniques in breeding for resistance to clover rot and to nematode infestation and some of the results achieved by various workers are discussed, mention being made of the Karaby and Spannarp clover strains which appear to have attained a considerable degree of nematode resistance as a result of natural selection. Both strains have been tested and further selected at Svalöf and Merkur red clover, which had also undergone selection for resistance to clover rot, was ultimately evolved from the Spannarp strain. Other red clover strains resistant to parasites are in process of production at Svalöf, while at Weibullsholm, Åkerberg has also obtained some resistant strains from Danish material. Some local strains from Central Sweden, e.g., Årsta from Stockholm county, appear to show more resistance to the parasites in question.
Work at Ultuna on rapid reactions to nematode infection in early sprouting plants has shown that differences in resistance as exhibited in the field are also found at the early stage and selection of resistant plants could therefore be hastened. A suitable technique for this work has been devised, though it is too early yet to assess its value in practical breeding operations.

The effect of factors such as light and temperature on infection is being investigated. The biology of the nematode, and race differences in infestation capacity must also be studied. Progress has been made in the production of diploid and tetraploid red clovers and comparative trials of their hardiness and yields have been carried out. Intensive work with this material is proceeding.

The importance of differences in features found to affect seed setting in red clover strains has been confirmed by work at Svalöf with the varieties Merkur, Harrie and Wambåsa, showing that the set was affected by the length and breadth of the corolla tube and apparently also by the time of flowering and physiological differences between strains (e.g. drought resistance).

At Ultuna Station a special grant from the Nilsson-Ehle Foundation has enabled work to be begun with a method of selection of red clover strains for types with high seed production with bees as the only pollinating insect. Diploid and tetraploid material has been used for this work.

Torssell's contribution to practical breeding research on lucerne is outlined as of basic importance for the investigations in progress at Ultuna, where the adaptation of lucerne to conditions of cultivation in Central Sweden, seed formation and seed setting are being studied. The conditions must be found under which large scale seed raising could be carried out in Sweden.

The problems in regard to lucerne are defined as follows: (1) the breeding of strains not requiring insect pollination to set seed and (2) the breeding of strains readily fertilized by insects, principally bees, or the selection of plants specially favoured by bees. The difficulties of these methods are considered.

While still giving much attention to seed formation in lucerne species and its genetical basis, the Ultuna Station must continue its efforts to obtain higher yielding, hardier and more persistent strains than the existing ones used in agriculture.

1653. Chistik, A. A. [Čistik, A. A.] 633.321–2.112–1.521.6(47)
(Drought resistance of clover on chernozem and grey forest-steppe soils).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1946 : Nos. 7–8 : 25–30.

Clover selection, begun about 15 years ago at the experiment station at Kursk (U.S.S.R.) with the local Makarovskii red clover, showed that yields were much more adversely affected by drought conditions on black soils than in grey forest-steppe soils.

A drought resistant variety with a well-branched root system in the upper soil layers should be bred for the black-soil zone.

1654. Guerra, J. B. 633.329:581.6(46.9)
Possibilidades da cultura do bersim (*Trifolium alexandrinum* L.) em climas continentais. [**Possibilities of cultivating berseem (*T. alexandrinum* L.) in continental climates**].
Rev. Agron. Lisboa 1945 : **33** : No. 2 : Pp. 7.

Information is given on the yield and chemical composition of a series of Portuguese berseem samples. This plant is thought to have some possibilities as a forage crop for regions of Portugal whose climate precludes the growth of standard forage crops.

1655. Schelhorn, M. v. 633.35:581.162
Blütenbiologie und Samenansatz bei *Vicia villosa*. **(Biology of flowering and setting of seed in *V. villosa*).**
Züchter 1946 : **17–18** : 22–24.

This paper shows the collected results of work carried out in 1942 and 1943.

In testing whether *V. villosa* is cross- or self-pollinated the bred varieties Ostsaat and Poppelsdorfer were used. The visits of bees were found to be very important for the setting of seed; but even when bees were excluded a few pods were set, and it is suggested that self-pollination may have occurred. After selfing and crossing flowers of colours known to be recessive the next generation showed 100% normal flowering, thus proving

cross fertilization to have occurred. Further proof that *V. villosa* is generally cross-fertilized is found in the appearance of chlorotic plants in races of common parentage, which have been selfed for several generations.
The final conclusion is that *V. villosa* may be considered to be mainly cross-pollinating and cross-fertilizing.
It is still a moot point whether a capacity for self-pollination and self-fertilization is a possible, or useful, aim in the breeding of *V. villosa.* E. W.

1656. Guerra, J. B., and
Piçarra, J. N. 633.35:581.6(46.9)
As vicias como forragem na região de Évora. (**Vetches as forage in the region of Évora**).
Rev. Agron. Lisboa 1945 : **33** : No. 2 : Pp. 11.
Information is presented on the yield and chemical composition of selected strains of *Vicia macrocarpa, V. Ervillia, V. sativa* and *V. monantha* in trials laid down at Hardade de Mitro and São Bento de Castris, Évora, Portugal.

1657. Pires, D. R. V. and
Wahnon, J. S. 633.35:581.6:575(46.9)
Ensaios de melhoramento de vicias. (**Breeding trials of vetches**).
Rev. Agron. Lisboa 1945 : **33** : No. 2 : Pp. 8.
Data are presented on the yield and chemical composition of Portuguese strains of vetch (*Vicia sativa* var. *obovata*).

1658. Lamberts, H. 633.367:575(49.2)
Some remarks on sweet lupin.
Farming, London 1948 : **2** : 90–91.
The work of breeding sweet yellow lupin at the Institute for Plant Breeding, Wageningen, Holland, is briefly described.

1659. Levin, Ja. S. 633.367:581.6:575(47)
[**Development of fodder (sweet) forms of perennial lupin**].
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1947 : No. 4 : 16–20.
Its tolerance of acid soils, frost resistance, early spring growth and other properties would make *Lupinus perennis* a promising crop if forms with sufficiently low alkaloid content could be obtained. Estimations at successive dates showed that the alkaloid content is highest in the youngest shoots and leaves, and this was estimated in 300,000 plants by a modification of the method described by Schwarze in Germany. Some 20 promising plants were selected and 14 of them survived. One of them, No. 0/1, had an alkaloid content of only 0·012% in the young shoots in May. Their protein and cellulose content was good and the plants are considered valuable both for forage and for silage.

1660. 633.367:581.6:575.061.6(48.5)
Årets försöksledarmöte i Stockholm. (**Annual meeting in Stockholm of directors of research**).
Lantmannen 1947 : **31** : 1029–31.
This report contains the following summary of lectures on sweet lupin research in Sweden:—

Winkler, H. — *Försök med gul sötlupin vid Flahult.* (*Experiments with yellow sweet lupins at Flahult*). (*p. 1029*).

This work began in 1939 and has included various problems of sweet yellow lupin cultivation as well as comparative variety trials of Svalöf No. 01501, sweet blue lupin (cf. Abst. 1662) and the yellow type. Nutritive value and usefulness as a green fodder crop are to be tested in digestibility experiments with livestock.

Petersson, G. — *Försök med sötlupin på Ugerup.* (*Experiments with sweet lupin at Ugerup*). (*p. 1030*).

The results are given of tests with yellow sweet lupin for yield of green leaves, stems, etc., and for seed.

Comparison of the yellow and blue species with serradella showed that the two sweet lupins, which were practically equal in protein yield, were surpassed in this respect by serradella.

Jarl, F. *Smältbarhetsförsök med sötlupinensilage.* (*Digestibility experiments with sweet lupin ensilage*). (*pp. 1030–31*).

This is a report on experiments at Flahult.

1661. Hagberg, A. and Josefsson, A. 633.367:581.6:575.061.6(48.5)
Blå sötlupin allvarlig konkurrent till gul. (**Blue sweet lupin, a dangerous competitor of the yellow**).
Lantmannen 1947 : **31** : 1024–25.

The past and present trend of sweet lupin breeding in Sweden and the methods used there are described. The main aims are earliness and a reliable yield of seed.

Breeding material from crosses between lines from a wild Portuguese population and yellow sweet lupin has now been raised, comprising lines with small, soft-coated seeds, but unfortunately still not superior to the original sweet lupin in earliness and yield; they have therefore not been released for the market.

The irradiation of yellow lupins has produced mutants that do not remain long in the rosette stage but are more like the blue lupin in habit. No types of direct practical value have yet been evolved from these mutants, but the greater variation following irradiation will be useful in breeding.

By hybridization between German sweet lupins and some blue bitter lupin lines with soft seed coats, a sweet hybrid line 01501, now called Borre was obtained: it has inherited the soft seed coat, and is as early as the old Karsholm lines and superior to them in yield of green forage.

Crosses are now being made between Borre and a very good bitter land variety from Veberöd in Skåne and bitter land varieties from the Baltic and Finland.

The Germans have maintained that the white-seeded yellow sweet lupin WK does not shed its seeds when drought sets in, but Swedish experiments have not led to confirmation of this claim, as WK is later than the other varieties in the trials.

Field figures are given for the Borre lupin and the original yellow sweet lupin obtained from Germany.

1662. 633.367.00.14(48.5)
Försöksledarmötet. (**Meeting of the directors of research**).
Lantmannen 1947 : **31** : 1042–43.

Papers read included the following:—

Gustafsson, H. *Sötlupin i den lokala försöksverksamheten.* (*Sweet lupin in local trials*). (*p. 1042*).

This note on experiments at Flahult touches on the climatic requirements and problems of cultivation of the yellow sweet lupin, e.g. rate of sowing, and its suitability to Götaland.

Ekstrand, H. *Höstsädens och vallgräsets övervintring.* (*Over-wintering of autumn cereals and herbage grasses*). (*p. 1043*).

The importance of resistance to fungous diseases as a factor in over-wintering and the existence of differences in varieties and strains in regard to such resistance were stressed.

1663. Ruge, U. and Krull, E. 633.39:581.142:633.524.3
Zur Keimungsphysiologie der Futter-Malve (Krull). [**On the physiology of germination of the fodder-mallow (Krull)**].
Züchter 1946 : **17–18** : 26–29.

The capacity for germination of seeds of the fodder mallow is very low. Growth is also uneven, so that yields per acre vary. Increase in the capacity for germination was therefore desirable.

The seeds are indifferent to light and have an optimum germination temperature of 15°–20° C.; temperatures above 20° are injurious. The germination capacity is markedly affected by the amount of moisture in the seed-bed and the pH. Final results showed that the seed is not hard coated, as has been hitherto supposed, but it needs a long time to mature before germinating. Exposure for 2 hours to a temperature of 70° brings the maturing process to completion and then uniform germination of 85% of the material takes place within 2–3 days. This is important for breeding work. Experiments at present being made seem to indicate that vernalization of the seeds, after swelling, will promote subsequent development of the seedlings; photoperiodic induction, which depends on the time of sowing, may also have a role in the development. E. W.

ROOTS AND TUBERS 633.4

1664. 633.4(72.9+8)
633.65(72.9+8)

Root crops and legumes in the Caribbean.
Caribbean Comm. Cttee Agric. Nutrit. Fish. For. Caribbean Res. Coun. 1947 : Crop Inquiry Ser. No. 4 : Pp. 128.

A survey is given of the production of root crops and legumes used for human consumption in the Caribbean territories of Great Britain, the Netherlands and United States. Prepared under the auspices of the Caribbean Research Council which was established by the Anglo-American Caribbean Commission in 1943, the survey provides information on varieties, organization of production, ecological conditions, problems of cultivation, diseases and pests, relation of production to local requirements, processing, research and other aspects of the production of various root and legume crops in each of the different territories.

1665. 633.42:581.143 26(48.1)
633.42:575.127.2:581.143.26.035.1

Nepe. (**The turnip**).
Meld. Hagebruket Året 1944 (1947).
Meld. Stat. Forsøksgard i Grønsakdyrking Kvithmar i Stjørdal 25 : 1944 (1946) G9–G32.
Tillegg G til Landbruksdirektørens årsmelding 1944.

The origin of the turnip is discussed with observations on its morphological characteristics. In considering its importance as an agricultural and horticultural crop the following problems are examined in some detail and with reference to certain varieties and species: bolting and length of day; temperature and growth; cultivation in frames and in the open; and the raising of varieties grown specially for the foliage instead of the root.
Mention is made of an F_2 from a cross between celery cabbage and the Nantaise turnip; the segregates have exhibited great variation but all have eventually reacted as long-day plants.
Many varieties of turnip are described and in some cases their alternative names are given.

1666 VAN KOOT, Y. 633.42:581.48:578.088
Herkenning van verschillende *Brassica*-soorten aan zaadkenmerken. (**Recognition of different species of *Brassica* by seed characters**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) Wageningen 1944 : No. 44/4 : 18–19. (Mimeographed).

Determination of seeds is based on characters of the seed coat. This can consist of the following layers: (1) externally there may be a mucous layer, of large white cells that swell in water; (2) beneath this are always the so-called "beaker cells" of which the side walls show typical corky thickenings, sometimes irregular causing a rough surface; (3) a pigment layer in which individual cells cannot be distinguished. The better this layer is developed, the darker the colour of the seed.
In *Brassica Rapa* the seed may be rough or smooth. It has a weakly developed pigment layer and is usually reddish brown. There is no mucous layer, and 100 seeds weigh 200 mg.
In *Brassica Napus* the seed is smooth and has a thicker pigment layer, being more blue-black in colour. There is no mucous layer and the 100 seed weight is 450 mg.

Both give a crop of which the lowest leaves are fairly dark green, petiolate and more or less pinnate.
In Chinese cabbage (*Brassica Napus* or *B. cernua*, approximately equivalent to *B. juncea*) the seed is mostly smooth and possesses a thicker pigment layer and darker colour. There is no mucous layer and the 100 seed weight is 350 mg. The crop has light green basal leaves, sessile and not pinnate with broad midrib.
In *Brassica chinensis* the seed is usually very rough and has a heavy pigment layer, and an obvious mucous layer, in which however, intact mucous cells can not always be distinguished. The colour is darker with a light grey wax and the 100 seed weight is 160 mg. The crop has dark green petiolate leaves, strongly notched and wavy.
The shape of the thickening of the "beaker cells" is a useful determining character. In the four species dealt with, they take the shape of a leaf, rod, dagger, or rod to club, respectively.
C. B.

1667. Rössger, W. 633.425:581.4:581.6:578.08
Beschreibung eines Boniturkastens zur Bestimmung des Verholzungsgrades der Kohlrabi-Knollen nach neuer Methode. (**Description of a comparator for determining the degree of lignification of kohlrabi bulbs by a new method**).
Züchter 1946 : **17–18** : 25–26.
Light is transmitted through thin sections of the kohlrabi bulb by illumination from below. Standard discs, photographically reproduced from sections of bulb and showing different degrees of lignification, are used for comparison with the sample to be tested. By allowing the sections for test to dry first for about a day, it is found that even the slightest trace of lignification becomes visible. Six hundred samples can be tested per hour.
The comparator is useful in large scale breeding work or varietal and fertilizer experiments.
E. W.

1668 Schwarze, P. 633.426:581.6:578.08:575
Zur Methodik der Auslese von senfölfreien Rapssorten. (**On methods of selecting rape varieties free from mustard oils**).
Züchter 1946 : **17–18** : 19–22.
The fodder value of rape is lowered by the presence of mustard oils, which are toxic. Varieties of rape, indigenous to Germany, which contain crotonyl mustard oil are less dangerous as fodders than foreign, e.g. Indian, varieties containing allyl mustard oil.
If a sufficiently large amount of genotypically heterogeneous material is used, it should be possible to breed varieties of rape free from mustard oils or of lower mustard oil content. Two chemical methods are described of testing for mustard oils in such improved varieties if found; in one method the sulphur of the mustard oil is detected as a film of silver sulphide on filter paper; the other method depends on precipitation of the sulphur after oxidation as barium sulphate.
E. W.

1669. Ricchello, A. and 633.491(43.7)
Goidànich, G. 633.491(49.2)
La produzione delle patate da seme in Cecoslovacchia e in Olanda nel dopoguerra. (**The production of seed potato in Czechoslovakia and in Holland after the war**).
Ann. Sper. Agrar. Roma 1947 : **1** : Suppl. No. 1 : Pp. 29.
Based on notes made during a tour of potato breeding and seed producing centres in Czechoslovakia and Holland in 1946, descriptions are presented of the organization of the work of inspection and control in producing seed potatoes and of the systems of registering new varieties. A description of the main Czechoslovak potato varieties is included; in that country, no variety may be registered unless it is resistant to all of the six existing biotypes of *Synchytrium endobioticum*.

1670. Stevenson, F. J. 633.491:575
Potato breeding, genetics and cytology: review of literature of interest to potato breeders.
Amer. Potato J. 1948 : **25** : 1–12.
Recent investigations on the genetics and breeding of the potato in the United States,

Great Britain, U.S.S.R. and other countries are reviewed. A section is included on new varieties recently developed in the United States. A bibliography containing 39 references is given.

1671. Esbo, H. 633.491:575(49.2)
Utsädespotatisen i Holland. (**Seed potatoes in Holland**).
Lantmannen 1948 : **32** : 161–63.

This is a record of a study tour made in Holland by H. Esbo, who is a member of the National Central Seed Control Institute [Statens Centrala Frökontrollanstalt] in Sweden, to study the Dutch system of seed control; standards for official approval of seed potatoes; the available choice of varieties; breeding and the general methods of cultivation.
There are 68 private breeders of potatoes in Holland and only one official institute for potato breeding.

1672. Choudhuri, H. C. 633.491:575(54.1)
Problem of seed potatoes.
Sci. and Cult. 1947 : **13** : 227–30.

Examination of potato samples from different parts of Darjeeling revealed four distinct types, the three varieties, Red Round, White Round and Great Scot, and Nainital which is a mixture of the varieties Magnum Bonum, Royal Kidney, Up-to-date and Great Scot. A table of diagnostic characters is presented. The areas of cultivation of the different varieties in the district of Darjeeling and their yields per acre when cultivated there are indicated.
It is suggested that future breeding work should include the development of new disease-resistant varieties by crossing wild and native cultivated potatoes with varieties introduced from the West.

1673. Rodríguez, M. 633.491:575(87)
Consideraciones históricas y económicas referentes al cultivo de la papa. (**Historical and economic considerations with reference to the cultivation of the potato**).
Agricultor Venezolano 1947 : **12** : No. 125 : 3–10.

A brief account is given of the potato varieties of Venezuela, which, it is thought, may be a secondary centre of origin for this crop. The following varieties are of potential interest to breeders: Viyorra, which has a short vegetative cycle; Reinoza, a variety with tubers of superior flavour; Arbolona, which bears the tubers close to the base of the plant; Panche, which keeps well under storage and tolerates unfavourable weather conditions; Blanco or Curuba, partially resistant to *Phytophthora infestans*; and Rosada, which will grow on dry and infertile soils.

1674. 633.491:575.42(44)
Un effort: reprise de la variété "Saucisse" au syndicat de Pont-l'Abbé. (**An endeavour: rehabilitation of the variety Saucisse by the syndicate of Pont-l'Abbé**).
Pomme de Terre Française 1948 : **11** : No. 104 : 23–24.

An account of the extent of the selection work carried out in France on the potato variety Saucisse and of its performance in recent years is presented, and a plea is made that more attention be devoted to this variety.

1675. Demesmay, H. 633.491:575.42(44)
Situation et avenir du plant français. (**Position and future prospects of the French plant**).
Pomme de Terre Française 1948 : **11** : No. 104 : 6–14.

Reference is made to selection work on potato varieties in France.

1676. Dupouy, L. 633.491:575.42(44)
Les progrès de la sélection des pommes de terre. (**The progress of potato selection**).
Rev. Hort. Paris 1944 : **29** : p. 128.

The Dutch method of individual selection of potatoes for disease resistance is described, and

the use of this method, of a similar method derived from it, and of mass selection in France is discussed.

1677. NECHIPORCHUK, I. D. [NEČIPORČUK, I. D.] 633.491:581.162.51:575"793"
(On the use of the "Mayka" variety in breeding potatoes for earliness).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1947 : No. 6 : 29–30.

The majority of early potato varieties are pollen-sterile and cannot be used as parents in crosses with such species as *Solanum demissum* and *S. curtilobum* or their F_1 hybrids. The variety Maïka from the Southern Dnieper basin is an early variety with good yield and cooking quality, though the tubers have deep and numerous eyes. It forms abundant viable pollen and sets fruit freely under normal conditions, and even in quite arid places and at high temperatures. It transmits its valuable properties such as earliness and yield to the selfed progeny. Seed sown in April, 1946 gave rise to 106 plants, of which 80 bore tubers by June, and the haulms of most of the plants dried in August. Segregation was observed in tuber colour, shape, size and number; tuber yield varied from nil in some plants to 1250 grm. for seedling No. 34, which had an average tuber weight of 83 grm., the tubers being uniform in size and having shallow eyes.
Maïka has been crossed successfully with other domestic varieties when serving as either pollen or seed parent.

1678. DUFRÉNOY, J. 633.491:581.6:575.115
Revue de la presse horticole et scientifique. **(Review of the horticultural and scientific press).**
Rev. Hort. Paris 1946 : **30** : p. 40.

The results of Rieman, Tottingham and McFarlane on the inheritance of the tendency of potatoes to blacken after cooking (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 270) are briefly summarized in French.

1679. WHEELER, E. J. 633.491:581.6:578.08
The testing of varieties as it applies to a potato program.
Amer. Potato J. 1948 : **25** : p. 62. (Abst.).

It is reported that a new technique makes it possible to test tubers for specific gravity and reaction to boiling in a single test and still have the tubers for planting. Soaking of plugs from tubers in 95% ethyl alcohol is substituted for boiling.

1680. 633.491:582:00.14(48.5)
ANDERSSON, G. 633.491–1.521.5(48.5)
Utsädesföreningens extra möte under Lantbruksveckan 1947. **(The extraordinary meeting of the Swedish Seed Association during the Agricultural Week in 1947).**
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 302–04.

O. Tedin gave a lecture on "Variety and Seed Problems regarding Potatoes", in which he discussed the "List of Recommended Varieties" recently drawn up for use in Sweden.

1681. GOEDEWAAGEN, M. A. J. and
WILLIGEN, A. H. A. DE 633.491–1.415.1:581.43(49.2)
Over de beworteling van verschillende aardappelrassen en de invloed, die de zuurgraad van de grond daarop uitoefent. **(On the rooting of various potato varieties and the influence thereon of soil acidity).**
Landbouwk. Tijdschr. Wageningen 1947 : **59** : 504–10.

Seven varieties of potatoes were grown on a plot of humous sandy soil across strips of which the pH was 4·55, 4·9, 5·5 and 6·3 respectively. Soil samples were taken, a fortnight before lifting, with an auger half-way between the plants (about a foot from each) and the weights of air-dry roots per litre of sample calculated. The haulms died off on the most acid strip. Varieties differed markedly in yield and root density, but there was no correlation between the latter.
The colour of the roots is characteristic for the variety, but is affected by acidity of soil, varying from white at pH 6 to brownish in the more acid soils.

Wilpo, Ijsselster and Industrie yielded best at pH 4·9, Voran and Gloria at 5·5, and Eigenheimer and Noordeling at 6·3. Rooting optima were pH 4·55, 4·9 and 5·5 for these groups respectively. C. B

1682. TEDIN, O. 633.491–1.521.5:001.4(48.5)
En riktsortlista för matpotatis. (Recommended list of varieties for table potatoes).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 133–37.

It has long been felt among Swedish potato growers that the number of varieties grown should be reduced and that varietal purity should be insisted on as a means of reducing the existing confusion caused by the use of wrong names or mixtures of varieties. To achieve these objects, the National Union of the Swedish Potato Growers [Sveriges Potatisodlares Riksförbund], formed in 1946, has drawn up the recommended list of varieties appended to the article under review, in consultation and in collaboration with various persons concerned with experiments on potato. The varieties are described and classified according to their likely performance under favourable or unfavourable conditions. Synonyms mentioned are President = Östergyllen-Favorit and Vit Drottning [White Queen] = Eldorado.

1683. HUDSON, P. S. 633.491–1.524(42)
The British Commonwealth Agricultural Bureaux's Potato Collection.
F.A.O. European Bull. 1948 : No. 4 : 271–73.

A short account is given of the wild and cultivated potatoes in the British Commonwealth Potato Collection and of the value of some of these forms in breeding for resistance to disease and pests and to frost.

1684. 633.491–1.524(8)
Potato research in Peru.
Amer. Potato J. 1947 : **24** : 427–29.

A brief account is given of two botanical collections of potatoes, now being established in Peru, which will be of considerable interest to plant breeders in all countries. One collection is that of Vargas at the University of Cuzco; the other collection is being established by the Agricultural Experimental Station, La Molina, on the outskirts of Lima.

1685. HAWKES, J. G. 633.491–2–1.521.6:575
L'autre trésor des Incas. **(The other treasure of the Incas).**
Bull. Musées et Collections, Genève 1948 : **5** : No. 3 : p. 1.

The history of the cultivation of the potato is outlined and reference is made to the use of South American potatoes in breeding for disease resistance.

1686. KRUŽILIN, A. A. 633.491–2.112–1.521.6(47)
(New drought resistant varieties of potato).
Socialističeskoe Zernovoe Hozjaĭstvo (Socialistic Grain Farming) Saratov 1946 : No. 4 : 41–45.

The drought resistant varieties referred to are Petrovskiĭ Jubileĭnyĭ [Petrov Jubilee], a seedling of Epicure produced in 1928, which is a high yielding early, table variety of high quality; Oktjabrenok, an early, high yielding variety with high starch content, suitable for table or industrial use; and Uljanovskiĭ, a table variety possessed of high quality, high yield and frost resistance. All three have yielded half as much again as Early Rose; Petrovskiĭ Jubileĭnyĭ has even exceeded such varieties as Lorh and Smyslovskiĭ [Fürstenkrone].
Measures are recommended for multiplying planting material of these varieties at the maximum possible rate.

1687. RIEMAN, G. H. and HOUGAS, R. W. 633.491–2.3–1.521.6(77.5)
Resistance of new potato varieties to common scab in Wisconsin.
Amer. Potato J. 1948 : **25** : p. 59. (Abst.)

Tests of the resistance to scab of ten newly named potato varieties, two standard American varieties and the scab resistant European variety, Hindenburg, revealed significant varietal

differences. All showed some susceptibility. Ontario and Menominee compared favourably with Hindenburg. Russett Sebago showed greater resistance than Sebago from which it was obtained by clonal selection.

1688. VAUGHN, J. R. 633.491–2.3–1.521.6.(77.6)
Factors affecting the nature of resistance of potatoes to scab.
Phytopathology 1948 : **38** : 27–28. (Abst.).

Abnormal pustule types of scab were found to be associated with certain seedling lines of potato at the Minnesota Agricultural Experiment Station. The variety Menominee was chosen for further investigation. It was found that the formation of the wound periderm was completed three times as fast in this resistant variety as in the susceptible Smooth Rural potato. It is suggested that the type of resistance found in Menominee is due to the high rate of formation of the wound periderm, which prevents the extensive penetration of the host tissue by the scab organism.

1689. EMILSSON, B. 633.491–2.3–1.521.6:575(48.5)
Varning för potatisskorven! **(A warning against potato scab).**
Lantmannen 1948 : **32** : 202–04.

Potato scab may be caused by any of a large number of forms or strains of *Actinomyces*, usually all classed under *A. scabies*, though exhibiting marked morphological and physiological variation. The particular strain of the pathogen and the variety of the potato affect the type of symptoms produced. Experiments conducted at different centres with many varieties of potatoes by the Swedish Institute for Plant Research and Cold Storage [Institutet för Växtforskning och Kyllagring] and German experiments have shown that, of the varieties grown in Sweden, only Ackersegen, Hindenburg and Jubel can be regarded from the practical standpoint as scab resistant. The rest are all more or less susceptible, Konsuragis, Erdgold and Ostbote, and possibly also King Edward and President being among the least so, but Majestic and Up-to-Date extremely so. To shorten the process of breeding resistant varieties American resistant varieties, e.g., Menominee (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 748), the recently released Ceneca*, Ontario and Cayuga, (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 1047) should be imported to test their resistance under Swedish conditions.

1690. 633.491–2.411.4:576.16:631.521.6:575(41+42)
BLACK, W. 633.491–2.8:576.16:631.521.6:675(41+42)
Recent developments in potato breeding.
Agric. Progr. 1947 : **22** : 48–49.

A succinct account is given of recent investigations in Britain on breeding for resistance to blight, leaf roll and mosaic.

1691. PRATT, A. J. 633.491–2.411.4–1.521.6(74.7)
Yield and grades of blight resistant potatoes grown in twenty different locations in New York State.
Amer. Potato J. 1948 : **25** : 57–58. (Abst.).

Of 17 new blight resistant potato varieties tested, 14 gave higher average yields than the standard varieties Green Mountain, Katahdin or Rural. Some of the varieties produce tubers of as good appearance as Katahdin tubers under a wide range of conditions. The importance of blight resistance was made evident by the occurrence of a bad blight season in most of the area.

1692. 633.491–2.411.4–1.521.6:575(73)
633.491–2.8–1.521.6:575(73)
A blight-resistant potato.
Gdnrs' Chron. 1948 : **123** : p. 113.

The development of a blight resistant potato, Kennebec, under the national potato breeding programme of the U.S. Department of Agriculture is announced. Kennebec is resistant also to certain virus diseases, including net necrosis and mild mosaic. It is a large variety with shallow eyes. The average yield in tests in Maine in 1947 was 675 bushels per acre.

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* ? = Seneca (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 748).

1693. 633.491–2.412.5–1.521.6(41)

New Scottish potato varieties.

Scot. Agric. 1948 : **27** : p. 237.

Notes are given on the maturity and tuber, foliage and flower characteristics of the new potato varieties Craigs Royal, Craigs Snow-White and Orion, which have been registered as approved wart immune varieties by the Department of Agriculture for Scotland. The first two varieties have been bred by the Scottish Society for Research in Plant Breeding, the last named by Smith. Craigs Royal is a second early, producing oval to long oval, partly pink coloured tubers, with shallow eyes and white flesh. Craigs Snow-White is a maincrop variety, yielding oval to kidney shaped tubers, with white skin, shallow eyes and white flesh. Orion, an early maincrop variety, possesses oval tubers, slightly indented at the heel end, with white skin, lemon coloured flesh and shallow eyes.

1694. 633.491–2.412.5–1.521.6(41+42)

Trials of potatoes for immunity from wart disease.

J. Minist. Agric. 1948 : **54** : 574–75.

The following have been added to the list of approved wart immune potato varieties: Ulster Prince, Ulster Emblem, Red Fife, Ulster Leader, Craigs Bounty and Ulster Supreme. Descriptive notes are given on each of the varieties.

1695. Tedin, O. 633.491–2.412.5–1.521.6:575(48.5)

Svalöfs Elsapotatis. Ny, kräftimmun, högavkastande matpotatis av god kvalitet. (**The Svalöf Elsa potato. A new wart immune high-yielding table potato of good quality**).

Sverig. Utsädesfören. Tidskr. 1948 : **58** : 11–16.

Details are given of the performance of this new wart immune variety which is derived from a cross between Alfa (van Dorst) and Sv 19149 which includes Early Rose, King George V, Goldball and Unica in its pedigree.

1696. Carroll, J. and Deasy, D. 633.491–2.6–1.521.6(41.5)

Slug damage to potato tubers.

J. Dep. Agric. Éire 1947 : **44** : 41–46.

Varietal differences in susceptibility to slug damage are reported. In general white-skinned varieties were the least damaged and pink or pink-splashed varieties the most damaged. Golden Wonder, a variety with brownish skin, and Arran Victory, a variety with purplish skin, were also badly attacked.

1697. Grison, P. and Ritter. 633.491–2.6–1.521.6(42)

Heterodera rostockiensis nématode dangereux pour la pomme de terre. (***H. rostockiensis*, a dangerous nematode for the potato**).

Pomme de Terre Française 1948 : **102** : 9–12.

Reference is made to the determinations, carried out by Ellenby in connexion with the Commonwealth Potato Collection of the resistance of potato varieties and of *Solanum Ballsii* to *H. rostockiensis*.

1698. Josse, G. 633.491–2.7–1.521.6:575.12

La lutte contre le doryphore en France. (**The battle against the Colorado beetle in France**).

Pomme de Terre Française 1948 : **11** : No. 104 : 18–22.

It is mentioned that certain American potato varieties are resistant to Colorado beetle but that the results of breeding for resistance in France and other countries do not, so far, show beyond doubt that it is possible to obtain resistant varieties of satisfactory quality by hybridization.

1699. Locke, S. B. 633.491–2.8–1.521.6(79.7)

Field resistance to leaf roll infection in potato varieties.

Amer. Potato J. 1948 : **25** : 37–43.

Tests of varietal resistance of potatoes to leaf roll virus carried out at three locations in Washington State are reported. The tests included 15 recently named and unnamed

seedlings in addition to eight older standard varieties. Comparison of the varieties on the basis of results obtained at Harrah only in 1944, since infection was relatively low at Pullman and Everson in that year, and at all three locations in 1945, showed that Katahdin was the most resistant with an average infection of only 15·9% and Sequoia second with 26·7%. The factors involved in field resistance are discussed.

1700. Schultz, E. S., Stevenson, F. J. and Akeley, R. V. 633.491–2.8–1.521.6:575(73)
Resistance of potato to virus Y, the cause of veinbanding mosaic.
Amer. Potato J. 1947 : 24 : 413–18.

Tests of varietal resistance to virus Y carried out at Aroostock Farm, Maine, during the period 1937–44 are reported. The varieties were interplanted in the field with the virus Y carrying variety 42898. Varieties that did not show infection in the field tests were subsequently exposed to heavy aphid infestation under cloth cages to test for immunity to virus Y. The reaction to virus Y infection in the field tests ranged from a high degree of resistance to susceptibility. Resistance was not necessarily correlated with the symptoms shown, since some of the most resistant varieties exhibited severe symptoms, similar to those observed in the less resistant varieties. Resistance to infection appears to be affected by the aphid dosage. Varieties that rarely contracted virus Y in the field generally become infected when heavily infested with aphids under cloth cages, or with a heavy dosage of aphids in the field. These results emphasize the importance of developing immune varieties. A few varieties have not shown infection, although exposed to virus Y for several seasons; additional tests are being carried out to determine whether they are immune to virus Y, or merely escaped infection.
Resistance to virus Y was found to be heritable. A greater number of resistant seedlings are produced from highly resistant parents than from susceptible parents, and the progeny from crosses between resistant parents may be more resistant to virus Y than the parents.

1701. Petersson, G. 633.491.00.14(48.5)
Sortförsök med potatis vid Statens försöksgård Ugerup under åren 1941–1945. (**Variety trials with potatoes at the Ugerup State Experimental Farm during 1941–1945**).
Medd. Lantbrukshögskolan Jordbruksförsöksanstalten Norrtälje, 1946 : No. 18 : Pp. 31.

The methods used in carrying out these Swedish trials and the subsequent chemical analysis of tubers are recorded, and the performance of industrial varieties and of those used for food is analysed. Some unnamed varieties are also cited, though the test period of three years was too short for decisive judgments.

1702. 633.491.00.14(49.4)
Das schweizerische Richtsortiment im Kartoffelbau 1946/47. (**The Swiss official selection for potato cultivation 1946/47**).
Schweiz. landw. Z. Die Grüne Pp. 7.

The official selection of varieties of potato recommended for Switzerland is given, with brief descriptions of each variety. Robusta and Arran Banner, both resistant to wart disease, have been included provisionally; Robusta is also resistant to *Phytophthora*, and Arran Banner fairly so. Kaiserkrone, Edelgard, Ostbote, Frühe Rosen [Early Rose] and Wohltmann have been cancelled. E. W.

1703. 633.491.00.14:581.6(49.2)
Verslag van de in 1941 en 1942 genomen interprovinciale rassenproeven met aardappelen. (**Report on the 1941 and 1942 interprovincial variety trials with potatoes**).
Meded. LandbvoorlichtDienst, Wageningen 1946 : No. 46 : Pp. 136.

The interprovincial variety trials are reported in detail as well as the results of 9 experiments carried out in various districts to investigate quality nd chemical composition.
Of the new first early varieties that are immune to wart disease none can compete with Eersteling [= Duke of York] or its red mutations, which are outstanding when lifted early

for a very high vitamin C content and a relatively high dry matter. Nederlander, Beteka, Limosa and Deva ripened too late, while Magneto, Frühmölle, Frühbote, Geelblom, Bintje and Duivelander were not of good quality, although the yield was good. Red Duke of York mutants did not differ from one another significantly, but were better than Duke of York as regards texture, vitamin C content and big tubers, even when lifted very early. The popular second earlies Bintje and Eigenheimer also seem difficult to replace. None of the other varieties showed the good qualities (reliability, good yield and starch content and very good quality) of Eigenheimer.

Bintje excels Eigenheimer in its shape, which makes it the ideal tuber for export; and it can be grown on spraing soils. The dry matter per acre and the tuber qualities are appreciably lower, however. Duivelander and Deva are less resistant to spraing and less suited to general cultivation; the former is only suited to clay soils. Nederlander had a high percentage of chats and occasional red patches in the flesh. Beteka had too many tubers. Geelblom exceeded Bintje in yield but cracks especially on clay soil. Eigenheimer also takes a foremost place amongst potatoes for winter consumption although the early sprouting susceptibility to spraing and blight in the tuber and the frequent hollow tubers depreciate its keeping value. Under good storage it will keep in very good condition until April. Bevelander can replace Eigenheimer on clay soils: it is quite resistant to blight in tubers and to hollow tubers, but the yield is 5 to 10% lower; quality and shape of tubers are also against it. The new variety Orion (Dorst 0194), tested on a limited scale only in 1942, was of quite good quality for eating and keeping; it has a high vitamin C content, but is susceptible to spraing and blight in tubers and the protein content is low. Prummel K 264 is promising as regards yield and quality.

Of the red skinned, late varieties, Furore and Iduna were best as regards yield and of good quality especially when grown on clay.

The yields of the best of the good keeping varieties Roode Star [Red Star] Nordeling and Zeeuwsche Blauwe [Zealand Blue] were appreciably lower than that of Eigenheimer, especially Roode Star, which was very low and also gave a lot of chats in 1941.

For feeding and manufacturing purposes the highest possible yield of dry matter is important and for this purpose Voran and Gloria exceeded Eigenheimer easily.

In all 47 varieties are dealt with, and an index to these makes references to the individual trials easy.

The chemical examination deals with dry matter, crude protein, ascorbic acid and aneurine contents, and correlates these with the length of the growing season, yield of tubers, dry matter content, and the yield of dry matter and protein.

The investigation into quality considers suitability for winter consumption, quality in the different experiments, and feeding value. C. B.

1704. Boswell, V. R. 633.492(52)
Sweet potatoes in Japan.
Nat. Hort. Mag. 1948 : **27** : 14–27.

An account is given of sweet potato cultivation in Japan. Notes are included on the following varieties: Gengi, Gokoku, Norin 1, Norin 2, Norin 3, Norin 4, Okinawa 100 and Tsurunashigengi. Mention is made of their resistance to disease.

FIBRES 633.5

1705. Dorasami, L. S. and 633.51:575(54.8)
Srinivasa Iyengar, G. 633.51:537.531:575.243(54.8)
American cottons—their cultivation and breeding in Mysore.
Indian Cott. Gr. Rev. 1948 : **2** : 9–16.

Work on the improvement of American cottons in Mysore was begun in 1919. The strains M.A.I., M.A. II, M.A. III and M.A. IV were developed from a cross between local Doddahatti or Dharwar-American cotton and *Gossypium purpurascens*. M.A. II was the most useful among these strains, being resistant to red leaf and improved as regards yield and other characters, although it did not compare favourably with standard American cottons. Further breeding has been carried out since 1936 under the scheme of the Indian Central Cotton Committee, to produce improved red leaf resistant varieties. Selection of acclimatized exotic cottons such as 289F/38, Co.2, N.T.38 or Gadag No. 1, and hybridization were

undertaken. The crosses Co.2 x Uganda and Co.2 x 289F/38 and their reciprocals have given several good strains, M.A. V and M.A. VI being most valuable. X-ray treatment has also been investigated; the new drought resistant strain M.A. IX has been produced by such treatment of Co.2. Data are given on the performance of Co.4, M.A. V, and other new strains, with different dates of sowing and in irrigated and rain fed areas. In general M.A. V has been found to be markedly superior to Co.4, M.A. II and the local cottons.

1706. Brown, C. H. 633.51:575(62)
Egyptian cotton-breeding technique.
Emp. Cott. Gr. Rev. 1948 : **25** : 35–37.
An account is presented of cotton breeding work at Giza, Egypt.

1707. 633.51:575(66.6+67.2)
633.174:575.42(66.6+67.2)
L'activité de l'I.R.C.T. pendant la campagne 1946–47. (**The work of the I.R.C.T. during the year 1946–47**).
Cot. Fib. Trop. 1947 : **2** : 129–38.
Selection, hybridization and varietal tests of cotton at the experimental stations of the Institut de Recherches du Coton et des Textiles Exotiques (Institute for Research on Cotton and Exotic Textiles) in French Equatorial Africa and the Ivory Coast are reported. Sorghum selection has also been carried out at Tikem.

1708. Grillot, M. and
Iltis, M. 633.51:575.42(64)
Compte rendu d'activité de la section textile du centre de recherches agronomiques de Rabat (Maroc). [**Account of the work of the textile division of the agricultural research centre at Rabat (Morocco)**].
Cot. Fib. Trop. 1947 : **2** : p. 139.
Cotton selection for productivity, earliness, good fibre length and disease resistance is reported.

1709. Wang, P. C. 633.51:581.141(51)
(**Unfertilized seeds of cotton**).
Nung Pao 1943 : **8** : 17–30.
An investigation was carried out to study the genetic and environmental factors causing the formation of infertile seeds of cotton. Such seeds are found in all varieties of cotton. They are less than 1 mm. in diameter, with no or very short hair. Fifteen varieties of both native and foreign cotton, producing varying yield, were studied for two years. The results are summarized as follows:—
(1) On the average the Chinese cottons contain 10·18% infertile seed and the American varieties 17·98%. Some varieties are constantly high and some are constantly low in the percentage of these seeds year after year.
(2) Most of the infertile seeds are found in the basal portion of the boll, some in the middle and further still in the tip.
(3) The percentage of infertile seeds is independent of nutrition and fertilizers.
(4) The percentage of infertile seed varies with season. It is higher in the early and the late flowers.
(5) The percentage of infertile seeds is positively correlated with temperature and negatively with atmospheric humidity. Temperature is comparatively more important.
H. C. Y.

1710. Fielding, W. L. 633.51:581.162.32:578.08(68)
Hybridization technique with cotton.
Emp. Cott. Gr. Rev. 1947 : **24** : 267–68.
The hybridization technique adopted as a routine practice at the Cotton Experiment Station, Barberton, South Africa, is described. It has been found that the best seed set was obtained from flowers which were emasculated in the early afternoon and cross-pollinated immediately with pollen from flowers which had just opened.

1711. Ware, J. O.,
Benedict, L. I. and
Rolfe, W. H. 633.51:581.48:575.11
A recessive naked-seed character in Upland cotton.
J. Hered. 1947 : **38** : 313–20.

Simple dominance of naked seed over fuzzy seed has previously been reported in Upland cotton. The data from crosses of Acadian Brown, a non-commercial variety of Upland cotton with naked seed from Louisiana, with fuzzy seeded varieties have shown that the character of naked seed in Acadian Brown is recessive to the fuzzy seed of the other varieties but that dominance of the latter character is incomplete. The results obtained by crossing Acala Mex, a variety possessing naked seed as a dominant character, and Acadian Brown suggest that the apparent dominance of naked seed hitherto found in Upland cotton is due to an inhibiting gene epistatic to a gene for the development of fuzz rather than to the pure dominance of a gene for naked seed. On the other hand the naked character in Acadian Brown appears to be determined by a single recessive gene.

1712. 633.51:581.6(54)
Annual Report of the Director Technological Laboratory for the Year Ending 31st May 1947.
Indian Central Cott. Cttee 1947 : Pp. 40.

A report is included of fibre and spinning tests on (1) agricultural samples of cotton received from the Agricultural Departments of the Province and States, (2) standard Indian cottons, (3) trade varieties; and of fibre tests on small samples of various cottons.

1713. Meulemeester, D. de and
Raes, G. 633.51:581.6(67.5)
Caractéristiques de certaines variétés de coton spécialement congolaises.
(Characteristics of certain cotton varieties especially Congo varieties).
Publ. Inst. Nat. Agron. Congo Belge 1947 : Sér. Tech. No. 34 : Pp. 103.

The results are presented of various tests to determine the quality of cotton fibres of different varieties. The methods employed are compared.

1714. Meulemeester, D. de
Raes, G. 633.51:581.6(67.5)
Caractéristiques de certaines variétés de coton spécialement congolaises.
(Characteristics of certain cotton varieties especially Congo varieties).
Publ. Inst. Nat. Agron. Congo Belge 1947 : Sér. Tech. No. 35 : Pp. 37.

Experiments to determine the strength of cotton fibres according to two different methods are described and the results for the various varieties tabulated. Among the cottons tested, the long fine fibres proved the strongest.

1715. Lord, E. 633.51:581.6:575
"Shots in the dark". Some aspects of future cotton production.
Emp. Cott. Gr. Rev. 1948 : **25** : 20–28.

A discussion is given of the possibilities of breeding new types of cotton, such as cotton with exceptionally long and coarse fibre which would have the advantage of increased resistance to abrasion and be suitable for blending with wool, short and fine cotton which might find favour with spinners requiring extra strength in a silky yarn and who are without suitable machines for dealing with the normal long staple of the very fine Egyptian varieties, a cotton without convolutions which would give yarn with a more lustrous and compact appearance than yarn from the usual cotton, cotton whose fibre retains a large hollow lumen as in kapok, or a cotton with different elastic properties from those of the cottons at present in use. Improvement in the characteristics of present types of cotton is also considered, with particular reference to breeding for increased fibre strength and decreased neppiness.

1716. 633.51:581.6:575(47)

Soviet cotton grows red.
Sci. News Lett. 1946 : 141, 143.

Naturally tinted fibres in Soviet Russia.
Sci. and Cult. 1946 : **12** : 274–75.

It is reported that cotton plants with naturally coloured fibres are being studied in Russia. In the majority of the plants tested the fibres were short and coarse and the crop yield low but considerable improvement has been effected by selection. The coloured fibres have a high wax content which gives greater resistance to decay.

Brown stapled varieties with excellent technological properties, closely approaching those of the best white-fibred varieties were obtained by B. Straumal from crosses between American coloured-fibred plants and white-fibred plants of the same type. These varieties ripen early and yield fairly good crops; their staple length is 30 mm., yield after ginning up to 35%, and tensile strength six to seven grams. They also have good wilt resistance. The fibres can be used for the manufacture of coloured fabrics without artificial dyeing.

I. Maximenko produced strains with fibres of shades previously unknown in nature by crossing plants of the purpurescent type with American and American with Egyptian species and subjecting their progeny to careful selection. He has produced plants with green fibres of high tensile strength.

1717 Afzal, M. 633.51–1.524:575(54)

American cottons in India—their introduction and development.
Indian Fmg 1946 : **7** : 457–62.

An account is given of the introduction of American cottons and the improved varieties which have been developed as the result of the programme of improvement inaugurated by the Indian Central Cotton Committee in 1921. The future prospects of the American cotton industry are discussed and current work aiming at improvements in yield, ginning out-turn and quality is briefly surveyed.

1718. Govande, G. K. 633.51–1.524.4(54)

Preservation of genic wealth of cotton.
Indian Cott. Gr. Rev. 1948 : **2** : 35–39.

The need for preserving natural populations of cotton with a view to their possible value in future breeding work is emphasized. Practical recommendations are given for a scheme of preservation with special reference to *Gossypium herbaceum* in Gujerat.

1719. Patil, A. S. 633.51–1.531:35(54.7)

Cotton improvement in the Bombay Karnatak.
Indian Cott. Gr. Rev. 1948 : **2** : 31–34.

An account is given of the scheme for the distribution and extension of the new strains, Jayawant and Gadag No. 1, selected from local Kumpta and Dharwar-American cotton, respectively, in the various Karnatak districts of Bombay Province.

1720. Panse, V. G. and
Khargonkar, S. A. 633.51–1.531:578.08(54)

Effect of seed quality on yield of cotton.
Indian Cott. Gr. Rev. 1948 : **2** : 17–22.

Experiments carried out under the Cotton Genetics Research Scheme, Indore, have shown that the sowing of large heavy seed results in increased germination, plant vigour and yield of seed cotton as compared with sowing of bulk seed. A simple method of seed separation suitable for use by cultivators is described. The method is recommended for both desi (*Gossypium arboreum*) and American (*G. hirsutum*) cotton strains.

1721. 633.51–2.3–1.521.6:575.11

Knight, R. L. 633.51–2.3–1.521.6:578.08:575.127.2

The genetics of blackarm resistance VI. Transference of resistance from *Gossypium arboreum* to *G. barbadense*.
J. Genet. 1948 : **48** : 359–69.

An account is given of the transference of B_4, a strong, partially dominant gene for blackarm

resistance from *G. arboreum* to Domains Sakel, an Egyptian commercial type of *G. barbadense*, by the back-cross method. The possible economic value of the gene is discussed; it segregates independently of B_1, B_2 and B_3 and acts additively with B_2 and B_3. The relative merits of the autotetraploid technique which was employed in this work and of the allotetraploid and straight transference methods are considered.

1722. VENKATARAMAN, V. 633.51.00.14(54)
Comparative tests on standard and trade varieties of Indian cottons.
Indian Cott. Gr. Rev. 1948 : **2** : 25–29.

The tests on standard and trade varieties of Indian cotton varieties carried out annually by the Technological Laboratory of the Indian Central Cotton Committee are discussed (cf. Abst. 1712).

1723. 633.52:575(48.5)
KNUTSSON, G. 633.854.54:575(48.5)
Olje och spånadsväxter i Uppsala län. (**Oil and fibre crops in Uppsala county**).
Sverig. Utsädesförén. Tidskr. 1947 : **57** : 197–99.

The role of oil and fibre crop production in Swedish agriculture is considered, mainly with reference to flax and linseed, poppies and hemp and breeding work at Ultuna.
The possibility of combining the cultivation of linseed side by side with fibre flax might, it is suggested, be realized at Gimo where a linen factory exists which could utilize the threshed linseed straw as a source of fibre for tow.

1724. 633.524.35–2.411.4–1.521.6:575.42(91)
633.524.35:575.12(91)
KIST, J. M and 633.524.35:576.356.5:581.04(91)
FRIEDERICH, J. C. 633.526.23:575(91)
De cultuur van enkele bast- en bladvezelleverende gewassen. (**The cultivation of some crops providing fibres from the bark and leaves**).
Landbouwk. Tijdschr. Wageningen 1947 : **59** : 337–45.

Roselle (*Hibiscus Sabdariffa*).
Following a full description of all aspects of the cultivation, harvesting, setting and drying, selection is dealt with. This is mainly for *Phytophthora* resistance and higher yield, and is carried out in various ways: (1) by line selection of high yielding, resistant varieties, the plant being self-pollinated; (2) varieties resistant to *Phytophthora* are bred by crossing non-resistant cultivated with resistant so called "wild" varieties, followed by repeated back-crossing to introduce the factor for high yield; (3) by attempts at interspecific crossing of roselle with Java jute (Deccan jute) which is immune to *Phytophthora*; (4) by colchicine treatment to obtain sufficiently fertile tetraploids.
With regard to method (1) seed of various lines is planted in rows and selected for general development, branching habit, thickness of bark and number of fibre bundles per unit of area, and for resistance by exposing the roots to earth in which *Phytophthora* has developed. This is done at the most susceptible stage, when the first flower buds appear. Seed of resistant plants is planted out and again tested for resistance and then for yield of fibre.
Varieties are easily crossed in method (2). The flowers are enclosed in bags of oiled paper. The basis of this work is that with self pollination in the F_7 a sufficient number of homozygotes will be present. F_1 seed is planted out in uninfected soil; the F_2 seed is planted in infected soil. From the survivors seed is collected individually and planted in separate plots in infected soil, and eventually tested for yield. Selection is also done for breeding true to seed.
Method (3) offers the best prospects, since Java jute (*H. cannabinus* L.) is not only resistant to *Phytophthora*, but also produces more fibres than the wild types, and the fibre is of better quality. However no success has been obtained by crossing in either direction in some 10,000 attempts, although one non-viable seed was obtained. Java jute x *H. surattensis* and the reciprocal cross gave no result, not did Java jute x *H. Eetveldianus*, but the reciprocal cross was successful in producing a freely flowering sterile F_1. Java jute x *H.*

radiatus was unsuccessful, but the reciprocal cross succeeded. The Java jute or *H. radiatus* characters appear to be inherited *en masse* giving fertile offspring, or if combination occurred, the offspring were highly sterile. Emasculation must be done late in the evening, or better still, at night. It is suggested that further endeavours should be made to cross *H. cannabinus* with *H. Sabdariffa*, using the latter preferably as the female. *H. radiatus* and *H. Eetveldianus* are both resistant to *Phytophthora* and should be considered for crossing with *H. Sabdariffa*. They both have 18 chromosomes compared with 36 in the latter Treatment of the seed with a solution of colchicine as in method (4) gave no result, nor did treatment of sprouting buds of cuttings. Good results were, however, obtained by dipping the growing point of etiolated seedlings in a 0·2% aqueous solution of colchicine for 2 to 9 hours. If the treatment is successful the growing point swells up and branches freely. Often only a few of the branches are tetraploid in the form of sectorial chimaeras. The tetraploids are distinguishable by thick fleshy leaves, smaller area of leaf, larger stomata, bigger corollas, fewer pollen sacs on the filaments, stronger and more prolonged growth and larger but fewer and often spongy seed. Seed from tetraploids is highly sterile.

Java or Deccan Jute (*Hibiscus cannabinus*) and *Jute* (*Corchorus capsularis* and *C. olitorius*). Brief notes are given on the cultivation of these fibre plants.

Sisal (*Agave sisalana*) *and Cantala Sisal* (*A. Cantala.*)
The habits, cultivation, harvesting and processing of the leaves are described. As yet only these two species are planted on a large scale, but a third, blue sisal, is being studied. Sexual reproduction occurs at the age of six or seven years when a flowering shoot emerges to a height of 8 feet for cantala and 13 feet for sisal. Pollen is produced copiously but viable seed is not produced. Reproduction normally occurs by bulbils, or young plants, developed on branches of the inflorescence, by root suckers, or by young plants that develop from axillary buds. By root pruning and pruning the inflorescence, during or before flowering, fruit setting may be induced and viable seed produced. Both species are apparently heterozygous; the F_1 offspring show a wide range of variation. The species can be crossed in either direction and both F_1 progenies have been back-crossed with sisal. Further work was stopped by the war. C. B.

SUGAR PLANTS 633.6

1725. 633.61(72.9+8)

The sugar industry of the Caribbean.
Caribbean Comm. Cttee Agric. Nutrit. Fish. For. Caribbean Res. Coun. 1947 : Crop Inquiry Ser. No. 6 : Pp. 343.

A survey is given of sugar production in the Caribbean territories of Great Britain, the Netherlands and the United States, prepared under the auspices of the Caribbean Research Council which was established by the Anglo-American Caribbean Commission in 1943. The publication provides information on the history of the sugar industry, acreage of cultivation, production, conditions of rainfall and soil, varieties, cultural systems, diseases and pests, research, including breeding, and other aspects of the sugar industry in each of the territories.

1726. Agete y Piñero, F. 633.61(72.91)

Work done at the Sugar Cane Experiment Station of the Cuban Ministry of Agriculture.
Proc. 20th Annu. Mtg Asoc. Tecn. Azucareros Cuba 1946 : 69–75.

The results of a survey of the sugar cane varietal collection at the Cuban Agricultural Experiment Station are reported. Varieties included in the collection are listed, and notes are given on the origin and characteristics of the Cuban varieties.

1727. Sánchez, P. A. 633.61(8)

Notes on the cultivation of sugar cane in South America.
Proc. 20th Annu. Mtg Asoc. Tecn. Azucareros Cuba 1946 : 107–35.

Reference is made to sugar cane varieties cultivated in Colombia, Peru, Brazil and Trinidad Island. Brief mention of breeding work in Colombia and Brazil is also given.

1728. DUTT, N. L. 633.61:575(54)
Sugarcane improvement in India.
Indian Fmg 1946 : **7** : 454–56.
An interesting account is presented of investigations on sugar cane improvement carried out by the Sugarcane Breeding Station, Coimbatore, and other stations in India.

1729. EVANS, H. 633.61:575(69.82)
Summary of annual report of the sugarcane research station for 1946.
Rev. Agric. Maurice 1947 : **26** : 285–87.
A summary is presented of the report already reviewed (cf. Abst. 1085).

1730. ARTILES, R. F. 633.61:575(72.91)
Preliminary report on new varieties of sugar cane obtained at Central Mercedes, Matanzas Province.
Proc. 20th Annu. Mtg. Asoc. Tecn. Azucareros Cuba 1946 : 93–96.
The technique of sugar cane breeding work at Central Mercedes, Cuba, is described. Seedlings whose parentage involves M.P.R. 63, Media Luna 3–18, POJ 2878, M.P.R. 28 and Florida are under observation. Breeding material to be utilized in future investigations includes the drought resistant cane Cristaline. It is also mentioned that POJ 2725 has proved valuable because it arrows conveniently at the usual time of crossing, its low pollen fertility renders it highly suitable as a female parent, and its seed has a high germinative capacity.

1731. AGETE Y PIÑERO, F. 633.61:575(73+72.9)
Notes on a trip through Porto Rico, Florida, Louisiana, Washington, D.C. and Hawaii.
Proc. 20th Annu. Mtg Asoc. Tecn. Azucareros Cuba 1946 : 11–34.
The article contains notes on sugar cane breeding work and varieties in Porto Rico, Hawaii, Florida, Louisiana and Washington. The visit was commissioned to obtain information which would be of assistance in planning the organization and work of the new Sugar Cane Experiment Station to be established in Cuba.

1732. SAN PEDRO, R. G. 633.61:575(86)
The Palmira Experiment Station, Del Valle Province, Republic of Colombia, and the work of producing the varieties E.P.C.
Proc. 20th Annu. Mtg Asoc. Tecn. Azucareros Cuba 1946 :149–50.
In sugar cane breeding work at the Palmira Experiment Station the following varieties have been used; Amu-Darya (*Saccharum spontaneum*) from Russian Turkestan, various Creole canes, P.O.J. 2878, Santa Cruz 12–4, M.C. 129 and P.O.J. 2725. Among the varieties finally selected E.P.C. 38 is the most outstanding. This variety was obtained from a cross between Colombian commercial cane and P.O.J. 2878. It shows a superiority in quality to the latter variety, and is to be tested commercially on a large scale.

1733. 633.61:575(94.3)
633.33–2–1.521.6(94.3)
633.363.00.14(94.3)
Forty-seventh Annual Report of the Bureau of Sugar Experiment Stations, Queensland 1947 : Pp. 53.

Forage Legumes
Cowpea hybrid strains were tested for bean fly resistance at the Central Sugar Experiment Station, Mackay, and the Southern Sugar Experiment Station, Bundaberg. Several strains exhibited promising resistance.
Trials of various cowpea hybrids were carried out at the Northern Experiment Station, Meringa; a number of hybrids showed wilt resistance. Trials were also made on the rice bean (*Phaseolus Ricciardianus*) at Meringa and Mackay.
Velvet bean varieties, e.g., Somerset, Marbilee, Jubilack and Smith, gave good results in trials at Bundaberg; they exhibited a high degree of drought resistance.

Sugar Cane

Varietal trials effected at the different experiment stations in Queensland are reported. The Report of the Committee on Seedling Propagation describes the cross-pollination work carried out in 1947 at the Northern Experiment Station, Meringa, seedling trials, and the varietal composition of the 1946 crop. Some of the parents used for crossing are nobilizations of *Saccharum robustum* canes while others have been developed from cold resistant *S. spontaneum* canes from Turkestan.

Notes are given on the following newer varieties: Q. 44, Q. 53, Q. 54 and Trojan in the Northern districts; P.O.J. 2878, Q. 50 and Trojan in the Central districts; and Co. 301, C.P. 29/116, Vesta, Q. 28 and Q. 52 in the Southern districts.

Trials of varietal resistance to gumming disease (*Bacterium vasculorum*), downy mildew (*Sclerospora Sacchari*), Fiji virus disease, leaf scald (*Bacterium albilineans*) and chlorotic streak were conducted.

1734. 633.61:575.24:575.7
STEVENSON, G. C. 633.61–2–1.521.6:575.7
Deterioration of sugar cane varieties.
Proc. Mtg B.W.I. Sug. Technol 1947 : 17–23.

It is pointed out that in general the economic utility of the newer seedling sugar cane varieties, as represented by the length of time they are commercially popular, is shorter than that of the former standard varieties. This general trend is due to the continued development of improved varieties and more efficient methods of varietal testing, particularly for distinct ecological zones, in addition to the fact that varieties tend to deteriorate in yielding capacity after longer or shorter periods of commercial cultivation. Possible causes of this apparent deterioration are discussed with reference to mutation, reduction in soil fertility, diseases and pests.

1735. 633.61:576.16:575.127(54)
PARTHASARATHY, N. 633.61:576.312.35(54)
Origin of noble sugar-cane (*Saccharum officinarum* L.)
Nature, Lond. 1948 : **161** : p. 608.

It is concluded from cytogenetical and morphological evidence that the north Indian sugar canes are complex polyploid hybrids derived from extensive natural crossing between *Saccharum officinarum* and *S. spontaneum* and that they are therefore of later origin than the noble canes.

The species composition of *S. officinarum* is now being investigated. It is considered to be an octoploid ($2n = 80$) with a basic chromosome number $x = 10$. In interspecific and intergeneric hybrids the haploid *S. officinarum* complement pairs autosyndetically owing to the polyploid composition of the species. When however there are only 10 or 20 *S. officinarum* chromosomes in a back-cross hybrid with *Sclerostachya fusca*, pairing between chromosomes of different complements shows that homology exists between the chromosomes of the two parental species. A study of the metaphase pairing in *Saccharum officinarum* x *Sclerostachya fusca* and successive back crosses to the latter shows that the basic number of ten chromosomes is really made up of two sets of five, of which one set is common to both species.

It is thus evident that the two species had a common ancestry through an unidentified basic species with $x = 5$ chromosomes, and this supports the view that *Saccharum officinarum* has existed in India from very early times and played a part in the evolution of the north Indian or indigenous canes.

1736. MUKERJI, B. K. and
KRISHAN, R. 633.61:581.165.7
"Rayungan" method for speedy multiplication of seed material in sugarcane.
Curr. Sci. 1948 : **17** : 55–56.

A modification of C. van Dillewijn's method of multiplying seed material of sugar cane is described, which has given satisfactory results at the Shahjahanpur Sugarcane Research Station, United Provinces. It consists of germinating the buds on standing cane prior to

planting in the field. The method ensures germination and has given more successful results than the normal method of planting setts in the soil.

1737. STEVENSON, G. C. 633.61–1.543(72.9+88)
The relative performance of different varieties as spring and autumn canes.
Proc. Mtg B.W.I. Sug. Technol. 1947 : 34–37.

The results are given of preliminary investigations on the performance of Co. 421, D 14/34 and other commercial varieties when cultivated as spring and autumn canes in British Guiana. It was found that the spring and autumn performance of the varieties showed no significant difference.
The discussion following the paper contributes observations on the problem of varietal performance as spring and autumn canes in Jamaica and other parts of the West Indies.

1738. TURNER, P. E. 633.61.00.14(72.9+88)
Researches on sugar-cane agriculture in the British West Indies and British Guiana, 1945.
Rep. Res. Work B.W.I. Sug. Ass. Barbados 1945 : 5–25.

The results of trials during 1945 and earlier years in the British West Indies and British Guiana on sugar canes of the B series and other varieties are summarized. Detailed varietal recommendations are made.

1739. TURNER P. E. 633.61.00.14(72.9+88)
Researches on sugar-cane agriculture in the British West Indies and British Guiana, 1946.
Rep. Res. Work B.W.I. Sug. Ass. Barbados 1946 : 5–25.

Data on the performance of sugar canes of the B series and other varieties during 1946 and previous years in the British West Indies and British Guiana are summarized. Detailed varietal recommendations are given.

1740. VENTRE E. K., BYALL, S. and CATTLETT, J. L. 633.62:581.192(73)
Sucrose, dextrose, and laevulose content of some domestic varieties of sorgo at different stages of maturity.
J. Agric. Res. 1948 : **76** : 145–51.

An analysis was made of the sucrose, dextrose and laevulose content of the juices obtained from 34 commercial sweet sorghum varieties at three stages of maturity.

1741. DECOUX, L. and SIMON, M. and WAUTHY, R. 633.63–2–1.521.6(49.3)
Les variétés de betterave sucrière en Belgique de 1942–1946. (**Sugar beet varieties in Belgium from 1942–1946**).
Publ. Inst. Belge. Amélior. Better. 1947 : **15** : 147–79.

Varietal tests of sugar beets carried out from 1942 to 1946 are reported. Yield and resistance to bolting are the chief factors taken into account but the disease resistance and germinative capacity of varieties are also mentioned. Eleven varieties which were included in all the tests are classified according to their sugar yield per ha., which varies from 7314 kg. to 8124 kg., being highest in Klein-Wanzleben E 1944.

1742. KVASNIKOV, V. V. [KVASNIKOV, B. V.] 633.63–2.111–1.521.6(47)
(**Selection of sugar beet according to its response to temperature**).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1947 : No. 5 : 10–14.

Seeds were germinated in sand at 8–11° C. and the seedlings with the largest shoots were selected and planted out at a temperature of 11–15° C. Those that bolted were rejected and the remainder produced seed which after vernalization contained only 4·5% of bolters. Under ordinary conditions this seed gave better germination at low temperatures and the seedling development was more vigorous and the yields were greater in northern areas.

1743 633.63.00.14(48.9)

Forsøg med Stammer af Foderbeder: Runkelroe, Fodersukkerroe og Sukkerroe 1944–1947. (**Trials with strains of fodder beets: mangels, sugar mangels and sugar beets 1944–47**).

Tidsskr. Frøavl 1948 : **18** : 351–55.

Details are recorded of the performance of 15 Danish strains of beets including four Barres strains of mangels, six strains of sugar mangels and three of sugar beets, grouped according to their dry matter content. All were placed in the first class and awarded the designation X.

1744. 633.63.00.14(49.3)

Compte-rendu de l'examen des champs d'essais de l'Institut Belge pour l'Amélioration de la Betterave, en 1947. (**Account of the examination of experimental plots of the Belgian Institute for the Improvement of the Beetroot in 1947**).

Publ. Inst. Belge. Amélior. Better. 1947 : **15** : 251–53.

Varietal and cultural tests in progress near Tirlemont are described.

STIMULANTS 633.7

1745. Bennett, R. and 633.71(75.6)
Garriss, H. R. 633.71–2–1.521.6(75.6)

A description of tobacco varieties for North Carolina.

Ext. Circ. N.C. St. Coll. Ext. Serv. 1947 : No. 302 : Pp. 8.

Tables give the adaptability in North Carolina of flue-cured tobacco varieties, and their characteristics including their reaction to black root rot and other diseases.

1746. Rogoziński, A. 633.71:575(43.8)

Cele i metody hodowli tytoniu. (**Aims and methods in breeding tobacco**).

Wiadom. Tyton. Warszawa Dodatek No. 1 : 1946 : 110–14.

Methods of breeding, including selection, hybridization, mutation and acclimatization are briefly mentioned, and also the aims in breeding different types of tobaccos, e.g. the production of a variety of *Nicotiana rustica* of high nicotine content for extraction and of varieties of *N. Tabacum* without nicotine. The Government Institute of Agricultural Science at Puławy has acclimatized and made selections of eastern types, e.g., Perustica, Trebizond and Herzegovina. A series of lines and varieties, e.g., Puławski Broad Leaved, Kentucky 3002, Kentucky x Szamoszaty etc. have been selected and bred for cultivation by the Polish Tobacco Monopoly. E. W.

1747. Haslam, R. J. 633.71:575(71)

Two new varieties of tobacco will be grown on a larger scale in 1948.

Lighter, Ottawa 1948 : **18** : p. 16. (Mimeographed).

The burley tobacco Harmony (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1464) and the flue-cured variety Delcrest, developed at the Dominion Experimental Farm, Harrow, Ontario, have been commercially released.

Delcrest is moderately resistant to black rootrot. The variety is of the Orinoco type, has outyielded the chief standard commercial varieties, and is slightly earlier maturing.

1748. Gentcheff, G. [Genčev, G.] 633.71:575:578.08(49.7)

(**Essential points in tobacco-breeding work**).

Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1945–1946 : **24** : 47–102.

The observable characters of tobacco plants which influence the quality and yield of tobacco are discussed, and certain plant and leaf characters are indicated as being important to the plant breeder from this point of view. The hereditary variability of these characters within the limits of the material studied, i.e., Bulgarian cigarette type varieties, is tabulated. Useful correlations are traced, e.g., between hairiness of the leaf and resistance to thrips. Recent work in breeding for mosaic resistance and thrips resistance is discussed, and finally the methods used in the successive stages of the breeding process are critically examined.

1749. KOSTOFF, D. and
GHEORGHIEVA, R. [GEORGIEVA, R.] 633.71:575.257:632.8–1.521.6(49.7)
(Studies upon the reaction of certain tobacco graft components against the tobacco mosaic virus.)
Arch. ges. Virusforsch. 1943 : **3** : 62–72.

Various grafts were made between different *Nicotiana Tabacum*, *N. rustica* and *N. glutinosa* varieties and hybrids showing different reactions to infection with the tobacco mosaic virus. Those in which infection is followed by the rapid spread of the virus are referred to as type A and those which form necrotic lesions as type B. An account is given of the interactions of the graft components as shown by their altered reactions to infection.

1750. WOLF, F. A. and
WOLF, F. T. 633.71:576.16(73+5)
The origin of tobaccos of the oriental type.
Bull. Torrey Bot. Cl. 1948 : **75** : 51–55.

Three tobacco varieties from the Near East were recognizable when grown in the U.S.A. as identical with varieties now under cultivation there. Apparently they were recently introduced into the Near East from America. Other varieties showed very little resemblance to American ones. The differences are such as might result from hybridization, selection and environmental factors acting during about 300 years since their introduction in the Near East.

1751. GANTSCHEFF, N. [GANČEV, N.] 633.71:576.312.35:581.192:582
(On the adsorption capacity and the lability of the exchange cations in a number of tobacco plants).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1943–1944 : **22** : 1–41.

In these investigations leaves of the following species and varieties were used: *Nicotiana Tabacum* var. *macrophylla* (2*n*), *N. Tabacum* var. *alba* (2*n*), *N. glauca* (2*n*), *N. Tabacum* var. *alba* (2*n*) x *N. glauca* (2*n*), *N. rustica* (2*n*), *N. sylvestris* (2*n*) and *N. sylvestris* (4*n*).
Results showed *inter alia* that the content of exchange cations increases when the chromosome number is doubled, thus *N. sylvestris* (4*n*) contains about 12% more exchange cations than *N. sylvestris* (2*n*); moreover, the adsorption capacity of the tetraploid is higher than that of the diploid for all the species and varieties studied. The content of exchange cations decreases with the age of the plant.
Increase in the adsorption capacity, when the chromosome number is doubled, is accompanied also by an increase in the mineral content. E. W

1752. GENTCHEFF, G. [GENČEV, G.] 633.71:576.356.5:575.127.2
(Genetical and cytological studies on some *Nicotiana* polyploids).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1941–1942 : **20** : 369–404.

Tetraploid plants of eight *Nicotiana* species and triploids of four species are reported to have been obtained by colchicine treatment. Fourteen allopolyploids were produced by crossing the tetraploids and diploids in different combinations. The morphology of the polyploids and hybrids is described and it is noted that sesquidiploids show more resemblance to the tetraploid parent than to the diploid. It is observed, also, that the dominance of certain characters which shows itself in the interspecific hybrids disappears in the sesquidiploids. The hybridizing ability of some species appears to be altered by tetraploidy. Data covering hybrid viability seem to indicate that, in this special case, the viability of the hybrid depends on the quantitative interrelation between the two parental genomes. Cytological studies show that the tetraploids and the hybrids which were examined, form a varying number of bivalents, trivalents and quadrivalents. In *N. Tabacum* (4*n*) x *N. sylvestris* (2*n*) the proportion of these was not as expected. Great variation was found in the fertility of the polyploids and hybrids, the sterility of a triploid *N. longiflora* plant being especially pronounced as compared with the other triploids. The same plant showed abnormalities in its tapetal development, and the parallel observations on tapetal development and sterility in this and other polyploids lead the author to conclude that the very high chromosome numbers in the tapetal cells of polyploids may result in physiological

disturbances which are probably the cause of sterility in some plants in which neither genic nor chromosomal causes are directly involved.

1753. Rogozinski, A. 633.71:581.141:581.162
Przyrodnicze podstawy wytwarzania nasion u tytoniu i oceny ich właściwości użytkowych. (**The biological principles underlying the production of tobacco seed and the evaluation of its useful properties**).
Wiadom. Tyton. Warszawa Dodatek No. 1 : 1946 : 172–82.
The biology of seed production is concisely described. E. W.

1754. Bowen, C. V. 633.71:581.192
Alkaloids in *Nicotiana attenuata* and *Nicotiana trigonophylla*.
J. Amer. Pharm. Ass. Sci. Ed. 1945 : **34** : p. 199.
Literature on the content of nicotine and nornicotine in *N. attenuata* and *N. trigonophylla* is briefly reviewed, and the results of analyses made according to a more modern method on the aerial parts and roots of the two species are presented.

1755. Staikoff, Zw. [Staĭkov, C.] 633.71:581.192:578.08
(**The gravimetric determination of nicotine as dipicrate**).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1941–1942 : **20** : 415–31.
This method of estimating nicotine is based on the facts that picric acid sublimes above its melting point, 122·5° C., whereas nicotine dipicrate is a stable solid up to its melting point, 218° C. Results showed the method to be no less accurate than the silico-wolframate method and more reliable than the titrometric method of Pfyl and Schmitt, especially for small amounts of nicotine. E. W.

1756. 633.71:582
Matuchno, I. 633.71(43.8)
Ogólne wiadomości z odmianoznawstwa tytoniowego. (**General information on the classification of tobaccos**).
Wiadom. Tyton. Warszawa Dodatek No. 1 : 1946 : 43–47.
Varieties of *Nicotiana Tabacum* and *N. rustica* are generally described and compared as regards the morphology of leaves, roots, number of leaves, flowers, number of seeds per grm. etc.
Types of tobacco cultivated in Poland are: Virginia, Trebizond, Herzegovina, Hungarian Garden, Tyk-Kulak and the Puławy cigar tobacco. E. W.

1757. Valleau, W. D. 633.71–2–1.521.6:575.127.2
Combining resistance to wildfire, mosaic, black root rot, and *Fusarium* wilt in burley tobacco.
Phytopathology 1948 : **38** : p. 27. (Abst.).
The burley tobacco Ky 23 was pollinated by the wild fire resistant species *Nicotiana longiflora*. The fertile seeds secured were treated with colchicine during germination. Four plants raised from the treated seeds were fertile when selfed and back-crossed. Resistance to wild fire is a dominant character; and back-crossing was carried out to eliminate as quickly as possible all the chromosomes of *N. longiflora* except the chromosome or part of it carrying the factor for resistance. The back-cross parents used were varieties resistant to mosaic and black root rot, or resistant to these two diseases and also *Fusarium* wilt. The mosaic resistance of these varieties was derived from *N. glutinosa*. A third back-cross generation has been obtained consisting entirely of tobacco-like plants. It is hoped that commercial varieties will soon be developed possessing resistance to all four diseases.

1758. Smith, T. E. and
Clayton, E. E. 633.71–2.3–1.521.6:575(73)
Inheritance of resistance to bacterial wilt in tobacco.
J. Agric. Res. 1948 : **76** : 27–32.
Line selection within varieties with a low degree of bacterial wilt resistance failed to increase resistance. By selection of intervarietal hybrids from crosses involving the susceptible flue-cured varieties Davis Special, Pinkey Arthur and 400, an F_6 generation was obtained

with a wilt-disease index of 55·8, as compared with the index of 95–100 for highly susceptible varieties and the index of 75–80 for the parents. This F_6 material was designated DSPA. Under field conditions of moderate wilt severity it yielded a full crop, but on heavily infected experimental plots DSPA showed less resistance than T.I. 448A, a source of resistance with a wilt disease index of 10 (cf. *Plant Breeding Abstract,* Vol. XIII, Abst. 907). In addition to DSPA and T.I. 448A, the genotype 79–X, derived from the cross T.I. 79A x Turkish Xanthi, has been investigated with a view to its value in breeding for wilt resistance. Crosses involving T.I. 448A as one parent have yielded highly resistant lines with good agronomic characters, but crosses involving 79–X have produced resistant segregates with small leaves of poor quality. The results show that resistance is recessive and controlled by multiple genes. The F_1 of the cross T.I. 448 x 79–X had significantly more wilt infection than either parent, indicating that the two strains have different genes for resistance. In crosses between T.I. 448A and susceptible flue-cured tobacco, variety 400 has produced the greatest number of resistant selections with good agronomic characters, and Oxford 26 was derived from a cross between T.I. 448A and variety 400 (cf. *Plant Breeding Abstracts,* Vol. XVI, Abst. 613).

1759. Clayton, E. E. 633.71–2.3–1.521.6:575.127.2(73)
Breeding tobacco for wildfire resistance.
Phytopathology 1948 : **38** : 5–6. (Abst.).

Nicotiana longiflora has been used as a source of resistance to wild fire disease. A fertile genotype with tobacco-like character, designated TL 106, was obtained from the first back-cross of the hybrid *N. Tabacum* x *N. longiflora* to *N. Tabacum.* The data obtained from advanced back-cross generations suggest that considerable chromosomal irregularity persists as the result of the interspecificity of the cross, but that as this irregularity is eliminated, segregation for reaction to wild fire on a simple basis can be expected. Resistance was not found to be linked with any undesirable growth characteristics.

1760 Jenkins, W. A. 633.71–2.411.4–1.521.6:575(75.6+75.5)
Strains of flue-cured tobacco resistant to black shank (*Phytophthora parasitica* var. *nicotianae*) and tolerant to certain root-rot complexes.
Phytopathology 1948 : **38** : p. 15. (Abst.).

Crosses were made during 1941 in Virginia between two black shank resistant lines and a strain of Yellow Special. The resistant lines were developed in North Carolina, from the cross Florida 301 x Warne back-crossed several times to Warne, and the cross Florida 301 x White Stem Orinoco back-crossed several times to White Star Orinoco respectively. The resistant parents showed about 80% resistance to black shank, but were low in quality and yield and also susceptible to root rot. The Yellow Special strain was susceptible to black shank, but superior in quality and yield and highly tolerant to root rot. Four strains of different leaf type, each with 95–98% black shank resistance, satisfactory quality and yield and tolerance to root rot have been selected from the hybrids, and tested in both Virginia and North Carolina.

1761. Kassanis, B. and
Selman, I. W. 633.71–2.8:576.16:631.521.6(42)
Variations in the reaction of white burley tobacco to the tomato aucuba mosaic virus and to some other strains of tobacco mosaic virus.
J. Pomol. Hort. Sci. 1947 : **23** : 167–70.

The white burley tobacco Judy's Pride from Wisconsin, Judy's Pride from Beltsville, Maryland, and a root rot resistant white burley tobacco obtained from the United States in 1943 and since propagated at Rothamsted, all developed the same symptoms when inoculated with the Rothamsted culture of tobacco mosaic virus, but showed two distinct types of reaction when inoculated with tomato aucuba mosaic and the Cheshunt culture of tobacco mosaic. Judy's Pride from Wisconsin developed no necrotic symptoms when inoculated with any of the virus strains used, whereas the other two lines reacted necrotically with tomato aucuba mosaic and the Cheshunt culture of tobacco mosaic. The results therefore show that, within one named variety of tobacco, there may be differences of

genetic constitution determining whether or not any particular virus produces necrotic local lesions. The significance of such genetical differences in the problems of virus diagnosis and in the selective action of the host upon new virus strains is discussed.

1762 633.71–2.8–1.521.6:575.127.2(49.7)
KOSTOFF, D. 633.71–2.8–1.521.6:575.115(49.7)
The reaction of parental tobacco plants and of their hybrids to "female sterility virus".
Arch. ges. Virusforsch. 1943 : **3** : 57–61.

Nicotiana glauca, which is tolerant to the so-called "female sterility virus", was crossed with other *Nicotiana* species which produce malformations when infected with the virus. The hybrids thus obtained were then (*a*) infected by grafting on to infected plants and (*b*) grown near infected plants. Amphidiploid *N. rustica* x *N. glauca* hybrids infected by grafting all showed the symptoms of infection. Amphidiploid *N. suaveolens* x *N. glauca* hybrids and *N. Tabacum* x *N. glauca* hybrids reacted similarly.

Of the *N. rustica* x *N. glauca* hybrids infected by growing near infected plants, the *N. glauca* like segregates tended to be less severely deformed than those resembling *N. rustica*. Back-cross plants with one *N. rustica* and two *N. glauca* genomes were less deformed than either *N. rustica* or amphidiploid *N. rustica* x *N. glauca* plants. In infected *N. suaveolens* x *N. glauca* hybrids the symptoms were very well expressed.

It is concluded from these observations that the tolerance of *N. glauca* towards the virus with regard to expression of the symptoms tends to be recessive.

N. glauca contains the alkaloid anabasine while the other species investigated contain nicotine, but the tolerance of *N. glauca* is not due to the anabasine, for anabasine content is a dominant character.

1763. YEH, C. S. 633.72(51)
(Famous tea varieties of Fukien).
Nung Pao 1942 : **7** : 480–82.

Notes are given on three of the most famous tea varieties in Fukien. Their origin, distribution, yield and vegetative characters, as well as the folklore connected with them are described. H. C. Y.

1764. AKTAN, R. 633.72(56)
Rize'de Çay. (Tea in Rize).
Küçük kitaplar Ankara 1946 : No. 9 : Pp. 123.
Neşriyat Müdürlügü Genel Sayi No. 631.

This publication provides an account of the geographical and climatic conditions of Rize, the soils, flora and ecology of the tea-growing area, the history of cultivating the crop, the cultural measures in use, plucking, and types of tea obtained from the different leaves.

To enable Turkey to be independent of foreign supplies of seed, a seed garden has been established in Rize. The annual yield is 5000 kg.

The various aspects of tea manufacture are also dealt with. Analyses are given of teas of the Pekoe and Souchong types, and of varieties such as Akkuyruk ['White Tail'], Imperiyal, No. 165 and No. 275.

1765. 633.72:575(47)
U.S.S.R. today. Russian tea.
Soviet News 1948 : No. 1896 : p. 4.

Information is given on the recent expansion of tea cultivation in the Transcaucasus. At the All-Union Scientific Research Institute of the Tea Industry breeding work is being carried out to improve quality and frost resistance. Valuable southern varieties have been developed by hybridization and selection. Varieties Georgian Nos 1 and 2 developed by K. Bahtadze [K. Bakhtadze] as the result of selection are described as exceptionally hardy and prolific.

1766. 633.72:575.42(54.8)
633.72:581.192(54.8)

Annual report of the Tea Research Institute of Ceylon for the year 1946.

Bull. Tea Res. Inst. Ceylon 1946 : No. 28 : Pp. 62.

Information is given on the yields and commercial quality of the different series of clones under observation at the Tea Research Institute, St. Coombs.

Additional mother bushes of the Assam type were selected and propagated for test of their rooting capacity.

Selection for resistance to blister blight (*Exobasidium vexans*) is receiving attention.

Investigations carried out in London on the green leaf have resulted in the isolation and identification of six catechin compounds of the polyphenol group; it is pointed out that there are no true tannins in tea. Clones of different quality are now being analysed for their catechin content with a view to studying a possible relationship between quality and specific catechins.

1767. Ferwerda, F. P. 633.73:575(91)

Enkele grepen uit het koffieveredelingswerk in Nederlandsch-Indië gedurende de laatste jaren voor den oorlog. (**Principles of coffee breeding in the Dutch East Indies during the years preceding the war**).

Landbouwk. Tijdschr. Wageningen 1947 : **59** : 358–63.

The development is sketched of coffee breeding in the Dutch East Indies since its inception in 1907, at which date *Coffea arabica* was unjustly viewed with disfavour. Breeding started with mass selection and passed through family selection to the highly specialized forms of selection described by Wellensiek in his handbook (cf. *Plant Breeding Abstracts*, Vol. XVI, p. 365). Vegetative multiplication has assisted by increasing knowledge of the mother trees, and particularly by enabling outstanding crosses to be obtained on a large scale. A recent development is the so-called "plastic seed gardens" of Hille Ris Lambers. These are monoclone gardens in which pollination is effected by dusting with pollen from another clone. The pronounced self incompatibility of *C. robusta* coffee reduces the chances of self-pollinated seed to a negligible level. In order to estimate the value of a cross, yields must be recorded for a period of five years for *C. robusta* and six or seven years for *C. excelsa*. Despite this, satisfactory progress has been made and seed available since 1935 has a yielding capacity of 150 to 200% of that of unselected seedlings.

The planting of clones for breeding work was quickly followed by commercial planting, with the mistake of planting in monoclone stocks, in ignorance of the fact that practically all the coffee grown in the Dutch East Indies is highly self-incompatible, except *C. arabica*. Since 1935, plantations of seedlings have been improved by top-working useless trees with clones.

A coffee plant only sets some 10–14% of its flowers. Abortion during the first five months after flowering is due to incompatibility or to non-viability due to combination of factors. During later months it is a physiological effect. Round beans are caused by the complete abortion of one of the two seeds of the berry and occurs in practically all species, but spongy seed, in which the endosperm ceases to develop after a time but the embryo develops fully, are typical of *C. arabica* and species hybrids. Both defects cause loss of yield. The former is negatively correlated with percentage setting of seed in *C. robusta* and *C. excelsa*. In both these sorts unfavourable weather that hinders cross pollination is the chief cause of round berry formation. No connexion between the formation of spongy seed and pollination or fruit set could be found. The spongy seeds typical of species hybrids are due to incompatibility of the chromosomes. The Kawisari hybrids of *C. liberica* ($2n = 22$ or 44) and *C. arabica* ($2n = 44$) provided striking examples of this in the abnormalities in formation of gametes and differing numbers of chromosomes in their endosperms.

The author also referred to the different habits of trees grown from grafts with different sorts of branch, e.g. water shoots and horizontal branches, and to the question of material for stocks, which can now be multiplied vegetatively. C. B.

1768. WILBAUX, R. 633.73:581.192(67.5)
Contribution à l'étude de la composition chimique des cafés du Congo Belge. (**Contribution to the study of the chemical composition of the coffees of the Belgian Congo**).
Rev. Agron. Colon. 1946 : **2** (5) : 13–24.
The results are presented of chemical analyses of different species of *Coffea*. Data on the size of the beans are also included. Some variation within species was found, for example the caffeine content of *C. robusta* varied from 1·57% to 2·68% of the dry matter.

1769. 633.73:581.483
MENDES, A. J. T. 633.73:581.163:575.356.5
A citologia e o melhoramento do cafeeiro. (**Cytology and the improvement of coffee**).
Bol. Superintend. Serv. Café 1947 : **22** : 236–40.
Recent investigations at Campinas have made it appear likely that endosperm is present as an important component of the seed.
A cytological examination has shown that the productive coffee line 387 is probably a tetraploid ($2n = 44$) form of *Coffea Dewevrei*.
The various *monosperma* forms of *C. arabica* appear to be diploids ($2n = 22$) derived parthenogenetically from the normal tetraploid forms. On treating *monosperma* derivatives of a Bourbon variety with colchicine, a chimaera was obtained showing vegetative segregation of Bourbon and *monosperma* characters. Colchicine treatment of *monosperma* forms may therefore provide a method of obtaining homozygous forms of Bourbon and Maragogipe coffees.

1770. POUPART, Y. 633.73:582(66.8)
Sélection des *Coffea Abeocutae* Cramer et *C. canephora* Pierre en Côte d'Ivoire. (**Selection of *Coffea Abeokutae* Cramer and *C. canephora* Pierre in the Ivory Coast**).
Agriculture 1945 : **9** : No. 55 : p. 27.
An account is given of the characteristics of the progenies of two trees of the Assikasso type of *C. Abeokutae*. A selection from one of these progenies was distinct from the rest and is described separately; it was very well adapted to local conditions and gave a yield of excellent quality. A *C. robusta* type is also described. All three types are being propagated in the Ivory Coast.

1771. ALVAREZ GARCIA, L. A. 633.73–2.484–1.521.6(72.95)
Studies on coffee root disease in Puerto Rico. 1. A coffee *Fusarium* wilt.
J. Agric. Univ. P.R. 1945 : **29** : 1–29.
The experiments carried out on coffee wilt and black rot disease (*Fusarium bulbigenum* Cke et Mass. var. *Coffeae* var. nov.) in Puerto Rico included tests on the resistance of seedlings of 28 coffee varieties. The variety Murta showed the highest degree of tolerance. Other varieties, such as Ceylon Hybrid, Dewevrei, Puerto Rico and Columnaris, showed a certain amount of tolerance. The acidity of the soil was found to be an important factor in determining whether infection will occur.

1772. 633.74:575(72.86)
Cacao investigations are summarized.
Cacao Inform. Bull. Costa Rica 1948 : **1** : No. 4 : Pp. 4.
Past and future investigations on cacao at the Inter-American Institute of Agricultural Sciences, organized in relation to the requirements of the cacoa industry, are briefly summarized under the main headings: (1) normal plant performance, (2) selection and (3) breeding.

1773. 633.74:575(72.86)

Technical and scientific developments. Cytologic and chromosomal studies at the Institute.

Cacao Inform. Bull. 1948 : **1** : No. 3 : 1–2.

The following investigations on cacao are reported from the Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica:—

A method of eliminating large numbers of *Theobroma Cacao* seedlings which are susceptible to *Phytophthora Faberi* has been developed. By spraying six-weeks old seedlings with a fresh spore suspension 100% infection and death of 90% of susceptible seedlings have been brought about. A modification of the technique is to be used for *Diplodia* infection. Correlation between the susceptibility of the seedlings to *P. Faberi* and that of the pods, however, has not yet been established.

The following species have been introduced for observation: *T. bicolor, T. grandiflora, T. cirmolinea, T. simiarum* and *Herranea pulcherrima.* In addition, pod collections from local *Theobroma* trees in Costa Rica, with various percentages of white seeds, different pod shapes, colours and sizes, are being studied.

Experiments are being made on hybridization between *T. simiarum* and *T. Cacao.* Seedlings of the former species are under tests for possible resistance to several diseases.

Cytological studies are in progress on species of *Theobroma* and *Herriana* with a view to discovering the origin of the cultivated crop.

The causes of self-incompatibility are being investigated cytologically.

1774. 633.74:575(8+72)

Conference at Turrialba inaugurates cacao center.

Cacao Inform. Bull. 1947 : **1** : No. 1 : Pp. 4.

Scientists and students at Turrialba.

Cacao Inform. Bull. 1947 : **1** : No. 2 : Pp. 4.

The objectives of the recently formed Inter-American Technical Committee on Cacao are defined. They include the encouragement of (1) the development of a co-operative inter-American research programme on cacao; (2) regional testing of selections; (3) uniformity in the recording of co-operative projects, according to approved forms; (4) the establishment of a cacao collection for breeding purposes at the Atkins Garden, Cuba; and (5) exploration of the chief regions where cacao grows wild, in collaboration with interested countries, the suitable collection of material for classification at the Atkins Garden, and its distribution to co-operating institutions.

The bulletins of the Inter-American Committee on cacao also briefly report selection and breeding work and various other investigations on cacao at the experiment stations in South and Central America, Mexico, Cuba and the Dominican Republic.

1775. Leefmans, S. 633.74:575:007(92)

Dr. C. J. J. van Hall.

Vakbl. Biol. 1947 : No. 11 : 161–63.

In this obituary notice, the numerous contributions of C. J. J. van Hall to the development of agricultural science in the Dutch East Indies are reviewed. His work on cacao breeding will be recalled by plant breeders, and his book, written in English, entitled "Cocoa," won for him an international reputation.

1776. Andersson, G. and Olsson, G. 633.75:575:581.6(48.5)

Några försöksresultat med vallmo, belysande sortfrågan samt oljehaltens variation. (**Some experimental results with the poppy that throw light on the variety problem and variation in oil content**).

Sverig. Utsädesfören. Tidskr. 1947 : **57** : 92–104.

The Mahndorf poppy, the most widely grown variety in Sweden, has long fragile straw but a high oil content of excellent quality. The poppy not being subject to attack by pests and being much less affected by over-ripening than other oil crops, it is worth cultivating and breeding in conditions to which other oil crops are unsuited. No new varieties have been produced and released for the market yet in Sweden, but the two German varieties, Mahndorf and Peragis, which are still the main choice for Swedish growers, have been

extensively tested by various Swedish research institutions, including the Swedish Seed Association and its local branch stations. Results have shown that Peragis is about four days earlier and has stiffer straw than Mahndorf, while the latter is higher yielding and has a higher oil content. The Swedish Seed Association has however succeeded, by crossing these two varieties, in raising new strains nearly equalling Peragis in strength of straw and in some cases surpassing Mahndorf in yield; but they will not be ready for release for a few years.

A comparison of experimental results from various Swedish sources does not support the view that a genetically conditioned deterioration in oil content invariably occurs in poppy varieties grown in Sweden. German work with Bulgarian, Turkish and Persian varieties has also confirmed this finding.

1777. GOLUBINSKY, I. N. [GOLUBINSKIĬ, I. N.] 633.79:575(47)
(A new hop variety Clone No. 18).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1946 : Nos. 3–4 : 6–9.

Clone 18 was obtained by individual plant selection started in 1932. It has yielded 13 to 16 c. per ha. as against 10–12 c. for the original plantation and its resin content was 18%, whereas in all other properties it was identical with the original form It is more tolerant of unfavourable growth conditions than most other varieties and has given better results in the Ukraine than any of the new varieties obtained from Salmon in England.

1778. RENÉ, G. 633.79:575(49.3)
Caractères morphologiques des sortes belges de houblon (*Humulus lupulus* L.) cultivées à la Station d'Esschene. [**Morphological characters of Belgian varieties of hops (*H. lupulus* L.) grown at the Esschene Station.**]
Ann. Gembl. 1948 : **54** : 15–23.

The qualities which are desirable in hop varieties for Belgium are discussed. Descriptions are given of nine Belgian varieties and of some hybrids. It is concluded that suitable varieties should be sought in three ways; by the introduction of foreign varieties, by selection of existing Belgian varieties and by hybridization.

1779. MENERET, G. 633.79:581.6(44)
Les houblons de la campagne 1945. (**The hops of the 1945 season).**
Brasserie, Paris 1947 : No. 7 : 6–12.

Data are presented on the quality of the different hop varieties grown in 1945 in Bourgogne.

1780. KEYWORTH, W. G. 633.79–2.484–1.521.6:575.42
***Verticillium* wilt of hops.**
Brew. Trade Rev. 1947 : **61** : 100–03.

The planting of resistant hop varieties appears to offer the speediest method of control of *Verticillium* wilt. Highly resistant varieties have been selected at East Malling but no immune variety has yet been found. Tests are still in progress but little more material is readily available. Varieties which prove resistant are tested also for their suitability for both the grower and the brewer. The two best varieties from the grower's point of view are OR 55, a mid-season to late variety yielding 20–22 cwt per acre, and OJ 47, an early variety yielding 18–20 cwt per acre. There is some evidence that mature plantations of Tutshams and possibly some of Goldings are slightly resistant to *Verticillium*.

AROMATIC PLANTS 633.8

1781. CROOKS, D. M. 633.8(73)
Plants for special uses.
Econ. Bot. 1948 : **2** : 58–72.

An account is given of the experimental and, in some cases, commercial production of the following plants, which has been stimulated by the necessity of the United States to be in possession of domestic supplies of drugs and other substances during the first and second world wars: belladonna; henbane; *Datura Stramonium*; *Digitalis purpurea*; *Digitalis lanata* (grown on a limited acreage in Pennsylvania and Wisconsin during the second world war

for export); ergot (*Claviceps purpurea*); pyrethrum; devil's shoestring (*Tephrosia virginiana*) red squill (*Urginea maritima*); *Nicotiana rustica*; domestic sage; condiment mustard; caraway; coriander; paprika (*Capsicum frutescens*); black or dwarf sumach (*Rhus copallina*); white or smooth sumach (*R. glabra*); staghorn sumach (*R. typhina*); canaigre (*Rumex hymenosephalus*); safflower; and castor bean. Mention is made of the work at present being carried out on pyrethrum, devil's shoestring, red squill (cf. Abst. 1454), sumach, canaigre, paprika and castor bean.

CONDIMENTS 633.84

1782. CHENNAVEERIAH, M. S. 633.842:576.312.3
A preliminary note on the karyotype in *Capsicum fastigiatum* Bl.
Curr. Sci. 1947 : **16** : 384–85.

The chromosome number of *C. fastigiatum* has been found to be $2n = 24$. It has been observed that nine pairs of the chromosomes have submedian constrictions and two pairs median constrictions, while the remaining pair is subterminally constricted; one of the pairs with submedian constrictions shows a well-defined secondary constriction.

1783. OLSSON, G. and RUFELT, B. 633.844:576.356.5:575.12(48.5)
Spontaneous crossing between diploid and tetraploid *Sinapis alba*.
Hereditas, Lund 1948 : **34** : 351–65.

Experiments showed that the yield of tetraploid white mustard is decreased, when diploids are growing near it, by fertilization with diploid pollen leading to the formation of triploid embryos, most of which abort. The percentage of triploid seeds, the percentage germination of the seeds and the percentage of abortive embryos decrease with increasing distance of the tetraploids from the diploids. The triploid seeds are much smaller than either diploid or tetraploid ones. The question why well developed triploid seeds can result from a cross between a diploid and a tetraploid only when the latter is the seed parent is briefly discussed.

OIL PLANTS 633.85

1784. BLACKMAN, G. E. 633.85(41+42)
Oil as a farm crop.
J. Fmrs' Cl. 1948 : Part 3 : 29–38.

The possibilities of the cultivation of linseed, sunflower, poppy, soya bean, safflower and rape as oil crops in Great Britain are discussed.

1785. OLSSON, G. 633.85:575:578.08(48.5)
De nyare förädlingsmetodernas betydelse vid oljeväxtförädlingen.
(**The importance of modern methods in the breeding of oil crops**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 81–91.

The established methods of oil crop breeding, namely pedigree breeding and hybridization combined with subsequent selection, are described with reference to work at Svalöf; and the origins of the rapes, Svalöfs Senraps B [Svalöf Late Rape B] released in Sweden in 1944, Svalöfs Regina Vårraps B [Svalöf Regina Spring Rape B] released in 1946, and of the new variety of flax, Sv 01040, are outlined.

Among the recent techniques discussed are (1) hybridization of inbred lines to obtain heterosis, often applied to sugar beets and now being used for white mustard and turnip rape; (2) induction of mutations by X-rays; and (3) induction of polyploidy.

Following irradiation of Svalöf Regina Spring rape, a new selection No. 0203 has been obtained; it is much more uniform in flowering than Regina, and has been handed over to the General Swedish Seed Co., Ltd. for multiplication; no late plants occur and the yield is somewhat higher than in the original variety. The loss of the variety Svalöf Primraps between the two world wars is recorded.

The soya bean Altonagaard AI exemplifies an induced seed colour mutation of black to brown.

Method (3) above is discussed in some detail with reference to the optimum chromosome number for species, the merits and defects of polyploid forms of different oil crops and their

crude protein and crude fat content, and experimental synthesis of existing or possible species, e.g., *Brassica napocampestris*.

Crosses between rape and *B. juncea* and between rape and black mustard have also yielded new species whose practical value has not yet been determined. Apparently white mustard is best suited to the chromosome reduplication technique. Attempts to combine the rapid development and insect resistance of white mustard with the higher oil content of spring rape by hybridization have not yielded a single hybrid; but A. Ljunger reports that he has obtained some hybrids between white mustard and the Chinese radish which has just as high an oil content as spring rape.

1786. Bontempo, E. 633.853.55:575(45)

La coltura del ricino. Miscugli di varietà e fenomeni teratologici. (**The cultivation of the castor oil plant. Mixtures of varieties and teratological phenomena**).

Ital. Agric. 1947 : **84** : 461–64.

The varieties of *Ricinus sanguineus* give the highest yields in Italy but are genetically impure. Descriptions are given of the main types found. Various teratological manifestations, such as fasciation, proliferation of male flowers and reduction of female flowers, are described and illustrated. Some of these are probably environmental but others may be hereditary, and the necessity for more intensive breeding and selection is urged.

1787. Ramanujam, S. and 633.853.74:576.312.35
Joshi, A. B. 633.853.74:576.312.34

Chromosome number of *Sesamum laciniatum* Klein.

Nature, Lond. 1948 : **161** : 99–100.

Cytological investigation of *S. laciniatum* showed that this species has $2n = 32$ chromosomes and that one chromosome in each group at second meiotic metaphase almost invariably stains less deeply than the others and shows very much less condensation.

Raghavan and Krishnamurthy recently reported the chromosome number of the species as $2n = 28$ (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 1280).

1788. 633.853.74:581.46:575.11
Langham, D. G. 633.853.74:575.11.061.6

Genetics of sesame.

V. Some morphological differences of the sesame flower (*S. indicum* L.).

VI. Some genetic variations in plant color in sesame.

J. Hered. 1947 : **38** : 347–52.

Brief descriptions are given in Part V of the following variations in the sesame flower which have been observed in the course of breeding work, and which differ from the characteristics of the typical flower; absence of foveola, various types of split flower, closed flowers, extra enations on the exterior of the corolla tube, extra tissues on the inside of the sesame flower, fused filaments, curled lip, defective foveolae, double lip, multiple flowers, large and small flowers, thick and thin petals, wide and narrow foveolae, and reduced lip of the petal. The characters of absence and presence of internal hairs and rough and smooth foveolae have also been studied.

The significance of the flower characteristics in sesame breeding is indicated. Data are given on the inheritance of a number of the characters described.

Plants with flowers possessing the character of extra enations on the exterior of the corolla tube developed indehiscent seed capsules. This valuable mutant form behaved as a single recessive to the usual wild type without extra growths. The type with fused filaments is recessive to the normal sesame with separate filaments. The character of rough foveola is a simple recessive to the smooth type. The character of reduced lip of the petal behaves as a simple recessive to the normal condition. The form of flower with curled lip in contrast to the usual straight lip has shown recessiveness in F_1 generations, but is difficult to classify in the F_2. The normal foveola as compared with the defective foveola has exhibited dominance in the F_1 generation; classification of this character has also been difficult in the F_2, although the defective forms occur in the proportion of approximately 25%. The size of the flower depends upon the inheritance of multiple factors. The presence or absence of internal hair has been found to depend upon seven different qualitative factors. A

"star" type of split flower is determined by recessive duplicate genes. Two types of closed flowers, one with normal lips and the other with petals which become necrotic on the day the flower would normally open, are recessive in the F_1 generation; a type of closed flower in which one half of the corolla, including the lip, remains green instead of becoming violet in colour, has shown dominance in the F_1; the F_2 generations in all the cases of closed flowers have not yet been studied.

Part VI describes seven seedling colour types and five plant colour types.

Three distinct types of virescent seedlings and one pale yellow type have segregated as simple recessives to green. The genetical behaviour of other yellow types has not been analysed on account of the difficulty presented by the segregation of intermediate grades. The tips of the first pair of true leaves may be purple, green or yellow, at the stage when the tips are barely visible between the cotyledons. Both the purple and yellow tips change within a day or so to green. Two types of purple leaf tip have been found. One type develops irrespective of whether the seedling germinates in the sun or shade. The other type develops a purple colour only in sunlight; in the shade it immediately develops a green leaf tip. The character of purple leaf tip is dominant to green or yellow leaf tip. The two types of purple tip are determined by complementary dominant genes, one of which has been found to be linked with a virescent form of seedling. In some F_2 progenies the green leaf tip is dominant to the yellow tip, while in other cases the reverse has been observed. Two complementary dominant genes have been isolated for green leaf tip. In the crosses in which yellow leaf tip is dominant to green, yellow leaf tip segregates as a character dependent upon a single dominant factor.

A line has been secured in which green and albino seedlings segregated in the ratio of 3 : 1. The heterozygous form is now under investigation.

The colour of the seedling stalk immediately below the cotyledons may be purple or green. Purple stem is dominant to green. Seedlings with the combinations of purple leaf tip and purple stem, green leaf tips and green stems, and purple tip and green stems have been found; the combination of green tips and purple stems have not yet been recorded.

Two types of purple stem and leaf petiole have been observed. One type develops in the shade or sunlight and is determined by a simple dominant gene; the other type develops only in sunlight, and is differentiated from the green plant type by dominant complementary genes Bronze stem and leaf petiole depend upon a simple dominant factor.

The character of dotted stem and leaf petiole is recessive to green stem and petioles and also to purple and bronze stems. The character of green stem and petiole behaves as a recessive to purple and bronze. Mottled leaf, consisting of yellow blotches on the green leaves of nearly mature plants, is a simple recessive character.

1789. Tkatchenko, B. [Tkačenko, B.] 633.854.56:575(47)
La culture du tung en U.R.S.S. (**The cultivation of tung in the U.S.S.R.**).
Rev. Bot. Appl. 1948 : **28** : 32–48.

Selection and hybridization of *Aleurites* are being carried out in Russia in order to unite the following characters: high resistance to cold, late flowering, short period of maturation of the fruit, fruit production in clusters, good development of the crown and high oil yield. Clone V.I.R.—2, which is almost entirely satisfactory as regards the first four specifications, is being used. *A. Fordii* x *A. montana* hybrids have fruited normally after 5 years but are of little interest. Of 4000 crosses between *A. Fordii* and *A. cordata* 80% were successful and produced fruits larger than those of *A. Fordii*; the oil quality was intermediate between that of the two parents. *A. cordata* x *A. Fordii* crosses gave fruits smaller than those of *A. Fordii*. All these interspecific hybrids showed less resistance to cold than is possessed by *A. Fordii*.

1790. Kozhin, A. E. [Kožin, A. E.], and
Klimenko, K. T. 633.854.56:575.127.2(47)
(**First results of interspecific hybridization of tung trees at the Batumi botanical garden**).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1946 : Nos. 11–12 : 21–24.

Hybridization of *Aleurites Fordii* x *A. cordata* was started in 1934; in the reciprocal cross

the set was much lower and many of the seedlings were of the maternal type. Those hybrids that were obtained however from the reciprocal cross displayed heterosis and were almost as large as pure *A. Fordii* seedlings. The seedlings flowered in the third year; flowering began late in May, as in *A. cordata*, but finished in early June, as in *A. Fordii*. Hybrids from the direct cross had pollen with 50% fertility whereas in those from the reciprocal the pollen was entirely sterile. In time of fruit ripening the hybrids were intermediate between the parents, though some were almost as early as *A. cordata*.

The flowers resembled those of *A. cordata* in structure and those of *A. Fordii* in size. Fruits and seeds were in most characters intermediate. The number of fruits was only about 40 per tree in the direct hybrids and 25 in the reciprocals when the hybrids were grown together, but when male flowers of *A. Fordii* were present up to 374 fruits per hybrid were produced. The number of seeds per fruit was low. The oil content of the hybrid fruit was lower than in the pure species.

The most interesting feature of the hybrids is thought to be their early maturity.

MEDICINAL PLANTS 633.88

1791. WOODWARD, E. F. 633.88(73)
Botanical drugs—a brief review of the industry with comments on recent developments.
Econ. Bot. 1947 : **1** : 402–14.

A general account is presented of many drug plants used in the United States, with particular reference to war-time changes in the foreign sources of supply of drug plants and the domestic cultivation of belladonna and other species.

1792. CROIZAT, L. 633.88:582
A new variety of *Croton Muelleri* Coulter.
Amer. Midl. Nat. 1947 : **38** : p. 767.

A comparative study of *Croton* species has convinced the author that *C. albinoides* (Ferg.) Croiz. is merely a variety of *C. Muelleri* which he names *C. Muelleri* Coult. var. *albinoides* (Ferg.) Croiz.

1793. YOUNGKEN, H. W. and 633.88:582:581.9(73)
WIRTH, E. H. 633.88:581.46(73)
A pharmacognostical study of European and American Arnicas.
J. Amer. Pharm. Ass. Sci. Ed. 1945 : **34** : 65–73.

Descriptions are given of the European species *Arnica montana* and of three American species, *A. fulgens* Pursh, *A. sororia* Greene and *A. cordifolia* Hooker, which are now being used as sources of arnica in America. Details of distribution and habitat of the American species are included, and an illustrated account is given of the gross structure and histology of the flower heads of the four species.

RUBBER PLANTS 633.91

1794. FERRAND, M. 633.912:575(92.1)
La sélection de l'hévéa. (**The selection of *Hevea***).
Rev. Gén. Caoutchouc 1944 : **21** : 45–49.

The marked differences in production between individual *Hevea* trees offers great scope for selection work.

Mother trees are selected not only on the basis of their observable characteristics, but also according to their ancestry. It is necessary to breed from a large number of trees and then select the best of the progeny for further breeding work.

The most important characteristics to look for in selecting mother trees are examined. Three years' observation is necessary in order to assess productivity.

The mother trees, when chosen, are propagated both sexually and vegetatively and the progeny obtained by both methods are subjected to selection. The procedure to be followed in each case is explained.

The extent to which selection can be practised on one-year old trees in the plantation is indicated.

Finally, yield data of some clones bred in Sumatra, Java and Malaya are presented.

1795. 633.912:582(8)
633.912–1.524:575(8)
SEIBERT, R. J.
A study of *Hevea* (with its economic aspects) in the Republic of Peru.
Ann. Mo. Bot. Gdn 1947 : **34** : 261–353.

The morphology of species of the genus *Hevea* is discussed in detail, with reference to the taxonomical value of the different morphological characters. Literature on the pollination of *Hevea* under natural conditions and the cytology of the genus is reviewed. The author considers the problem of intraspecific variation, and gives a list of intraspecific variations in many morphological characters according to his observations of *H. brasiliensis*. An identification key to the principal species and varieties of *Hevae* is presented, and the following species occurring in Peru are described, the descriptions being based upon the study of Peruvian material collected by the author: *H. guianensis* Aubl., *H. guianensis* Aubl. var. *lutea* (Spruce ex Beuth.) Ducke et Schultes, *H. nitida* Mart. ex Muell.-Arg., *H. pauciflora* (Spruce ex Beuth.) Muell.-Arg., *H. Benthamiana* Muell.-Arg., and *H. brasiliensis* (HBK.) Muell.-Arg. Information is included on synonyms, vernacular names, and the known natural distribution in South American countries, with details of occurrence in Peru. Available knowledge on the natural occurrence and range of *Hevea* species in Peru and the neighbouring countries is discussed, accompanied by a map based upon data from various sources; and the possible role of geological changes in the distribution of *Hevea* species in the Amazon valley and the surrounding regions is traced.

The following putative hybrids found in Peru are described: *H. brasiliensis* x *H. guianensis* var. *lutea*; *H. brasiliensis* x *H. pauciflora*; *H. guianensis* x *H. pauciflora*; *H. guianensis* var. *lutea* x *H. Benthamiana*; *H. guianensis* var. *lutea* x *H. pauciflora*; and *H. guianensis* var. *lutea* x *H. pauciflora* x *H. brasiliensis*.

The paper concludes with a discussion on the value of jungle selections of *H. brasiliensis* and other species, and interspecific *Hevea* hybrids in breeding for disease resistance and other characters.

1796. CATCHESIDE, D. G. 633.913:576.356.4
The B-chromosomes of *Parthenium argentatum*.
Heredity 1947 : **1** : 393–94.

The meiotic behaviour of the heterochromatic B chromosomes in *P. argentatum* is described

1797. NEUMAN, G. B. [NEĬMAN, G. B.] 633.913:576.356.5(47)
(Field tests of the tetraploid kok-saghyz).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.). 1947 : No. 4 : 8–10.

Comparative tests were made with a tetraploid strain, a selected diploid strain, No. 485, and an unselected commercial strain. All three germinated, flowered and matured at approximately the same time. In unthinned plots there was no significant difference in the yield but in thinned plots No. 485 gave the highest yield and also the highest rubber percentage in the roots, hence also the highest yield of rubber per hectare. The yields were 47·9 c per ha. for No. 485, 29·3 for the unselected diploid and 29·1 c. per ha. for the tetraploid.

1798. MEDVEDEV, P. F. 633.913:581.6.056
(Geographical factor in rubber accumulation).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1947 : No. 4 : 3–7.

The majority of rubber-bearing species and genera are natives of arid areas in tropical or subtropical zones. Many of them, such as *Asclepias erosa, A. subulata* and guayule, when grown in the North Caucasus, form little or no rubber, but when grown in the arid zones of Transcaucasia they may form as much rubber as in their native habitat. Conversely, a species such as *Solidago Virgaurea*, which normally forms no rubber, will give up to 4% in the leaves when grown in the Kubanj. Though the differences are not so great, a similar variation has been observed in species containing rubber in their roots.

1799. SCHNEIDER, H. 633.913–2.484–1.521.6(79.4)
Susceptibility of guayule to verticillium wilt and influence of soil temperature and moisture on development of infection.
J. Agric. Res. 1948 : **76** : 129–43.

Experiments conducted in California have shown that commercial strains of guayule differ in their susceptibility to *Verticillium albo-atrum*. Strains 405, 407 and 416 were found to be most resistant in field plantings, although occasionally plants might be killed when young. Strains within morphologically similar groups were in general also similar in resistance to the disease. The results of field irrigation experiments revealed that the fungus is active in soil at all moisture levels above wilting point. Maintenance of the upper soil levels at the wilting point therefore prevents infection, although this method of control is not practicable until the plants have been established. Experiments in constant temperature tanks showed that the fungus becomes inactive at soil temperature between 80° and 85° F.

FRUITS AND NUTS 634

1800. 634:575(48.5)
SONESSON, N. 634.00.15(48.5)
Vår uppfattning..... (**Our view**.....).
Fruktodlaren 1948 : **19** : 7–8.

The view is expressed that the Swedish Institute for Fruit Tree Breeding at Balsgård merits increased financial support from public and private funds for its valuable work and future development (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 829).

1801. 634:575(49.4)
Stations fédérales d'essais viticoles, arboricoles et de chimie agricole, à Lausanne et à Pully. Rapport d'activité 1946. (**Federal stations at Lausanne and Pully for experiments in viticulture, arboriculture and agricultural chemistry. Annual report 1946**).
Landw. Jb. Schweiz 1947 : No. 360 : 701–92.

The report contains the following information of interest to plant breeders. Study of the pollen germination and growth of the pollen tube of the Chasselas vine has shown that these phenomena are influenced not only by the temperature at the time of pollen germination but by the temperature during the time preceding flowering.

Over 3000 seeds have been obtained from reciprocal crosses between the vines Seibel 1000 and Seibel 5455. Seeds of various other hybrids are to be grown, as also are seeds produced by self fertilization of Seibel 5455 so that its progeny may be studied.

Attempted hybridizations of peas were unsuccessful.

Nearly 950 seeds were obtained from crosses of the apricot variety Luizet with Blanc-Rosé, Paviot, Poizat and Corot. In order to develop an early cherry variety with firm flesh, 1700 flowers of Bigarreau Moreau were pollinated with pollen from Erstfrühe [First Early] Zweitfrühe [Second Early] and Basler Adler [Basel Eagle]. The percentage of normal embryos in the seeds from these crosses was low, probably, it is suggested, because the factor for earliness is linked with a factor for embryo mortality.

The results are presented of tests of the quality of wines from different direct producer hybrids and European vines, both red and white. Yield data extending over several years are presented for various vines.

Dessert grapes of 14 varieties were tested for keeping quality.

Comparative tests of stocks of peaches and apples are reported.

1802. AROEIRA, J. S. 634:575(73)
Aspectos da fruiticultura nos Estados Unidos. (**Aspects of fruit cultivation in the United States**).
Ceres, Brasil 1946 : **7** : 184–91.

Brief mention is made of work in the U.S.A. on pollination problems, pollen storage and breeding methods.

1803. 634:575:35(49.2)

Keuringscommissie voor Fruitgewassen. **(Certifying Committee for fruit crops).**

Fruitteelt 1948 : **38** : p. 85.

The procedure to be adopted was agreed as follows:—

(1) A minimum of ten fruits must be entered. (2) A subcommittee will sift out the less valuable varieties. (3) A variety that has passed the subcommittee is to be subjected to a careful scrutiny for colour, taste and appearance. (4) Varieties which are recommended for trials will be investigated by the Horticultural Adviser for productivity, health, vigour, etc. (5) Varieties which satisfy the requirements at this field inspection will be examined in the field by the Committee. (6) Grafts of satisfactory varieties will be planted out in experiments scattered over the whole country. C. B.

1804. 634:581.162.3

EVREINOFF, V.-A. 634.25:581.162.5

Sur quelques anomalies de la floraison chez le pêcher. **(On some anomalies of flowering in the peach).**

Rev. Hort. Paris 1947 : **30** : 213–16.

A survey is presented of the findings of various authors concerning the influence of the time of pollination with respect to the maturing of the stigma on the percentage of fruits set in the case of various tree fruits. In general protogyny does not appear to be a serious obstacle to pollination.

Variations in the fertility of the peach are attributed to the maturing of the pistil before the opening of the flower, the dehiscence of the stamens in the closed bud, and curvature of the pistil. The varieties in which these phenomena have been observed are indicated.

1805. SAX, K. 634–1.524:575.12(93)

Plant Breeding at the Arnold Arboretum.

Arnoldia 1947 : **7** : 9–12.

Nearly a thousand plant species and varieties have been introduced into cultivation in the United States by the Arnold Arboretum in about the last 60 years. Hybridization work has included the crossing of *Pinus Strobus* with *P. Griffithii* and with *P. parviflora.* Breeding work was started at the Arnold Arboretum nearly 20 years ago. The general procedure followed in producing and testing a new variety is outlined. Most of the varieties referred to are ornamental plants, but a number of promising apple varieties have been obtained by hybridization.

1806. 634.1:582

FERNALD, M. L. 634.973:582

Minor transfers in *Pyrus*.

Rhodora 1947 : **49** : 229–33.

It is proposed, in view of the unsatisfactory distinguishing criteria, that the genera *Malus* Mill., *Sorbus* L. and *Aronia* Medic. should all be included under *Pyrus* L.

1807. 634.11:575(74.7)

OBERLE, G. D. 634.25:575(74.7)

The New York State Agricultural Experiment Station peach and apple breeding programs.

Virginia Fruit 1948 : **36** : 79–88.

Apple and peach breeding work at the New York Agricultural Experiment Station is described.

1808. HOWLETT, F. S. 634.11:575(77.1)

The Melrose apple.

Fruit Varieties and Hort. Digest 1946 : **1** : 92–93.

The Melrose apple (cf. *Plant Breeding Abstracts,* Vol. XVI- Abst. 1597) is described. It is a cross between Jonathan and Delicious. Because of its late-harvesting and late-keeping characteristics and high dessert quality it should supplement Stayman Winesap and Rome Beauty. At Wooster the fruits are picked just before or at the same time as Stayman Winesap and kept in cold storage until April. They are well coloured, carmine and yellow,

intermediate in size between Jonathan and Delicious and free from Jonathan spot and from scab but are rather readily russeted. The flesh is firm and rather fine grained and the flavour is intermediate between that of the parents. The cooking quality is good.

1809. Blaser, H. W. and
Einset, J. 634.11:575.255
Flower structure in periclinal chimeras of six apple sports.
Amer. J. Bot. 1947 : **34** : p. 580. (Abst.).
The distribution of diploid and tetraploid tissue in the flowers of six spontaneous apple sports is discussed.

1810. Dermen, H. and
Darrow, G. M. 634.11:576.356.5:575.255(73)
A tetraploid sport of McIntosh apples.
J. Hered. 1948 : **39** : p. 17.
A giant sport of the apple variety McIntosh has been discovered by R. Kimball of Massachusetts. Cytological investigations at the Plant Industry Station, Beltsville, Md, have shown that the sport is a diploid-tetraploid periclinal chimaera, the epidermis being diploid and the internal tissues of the stem and leaves tetraploid. It is suggested that if similar periclinal chimaeras can be discovered in such varieties as Red Delicious, Golden Delicious, Jonathan and Winesap, which as diploids have proved valuable in breeding, numerous tetraploid seedlings could be obtained by crossing the McIntosh tetraploid chimaera and these chimaeras. The use of the McIntosh sport in crosses with diploids to produce triploid seedlings can also be explored.

1811. Einset, J.,
Blaser, H. W. and
Imhofe, B. 634.11:576.356.5:575.255(73)
Chimeral sports of apples.
J. Hered. 1947 : **38** : 371–76.
An account is given of six apple sports which constitute three different types of periclinal chimaera, which have been studied at the New York State Agricultural Experiment Station. The first type is predominantly tetraploid with only the epidermis of diploid tissue. In the second type the epidermal and subepidermal tissues are diploid, and the remaining tissues tetraploid. The third type is similar to the second but has more diploid cells; it may have three layers of diploid cells covering the tetraploid portion in the stem tip; in the leaves and flowers the amount of tetraploid tissue is very limited. The first type breeds as a tetraploid, the second and third types are diploid in their reproduction behaviour. Five of the sports were sent to the station as large fruited or giant forms. The characteristics of the trees, fruiting habit, fruit, leaves and buds which distinguish the sports from the parent varieties are given.

1812. 634.11:577.16(42)
Long Ashton Annual Report.
Gdnr's Chron. 1948 : **123** : p. 57.
Results presented in the above report for 1946 on the ascorbic acid content of apple varieties are summarized.

1813. 634.11:581.6(42)
Recommended cider apples.
Gdnr's Chron. 1948 : **123** : 49–50.
Lists of varieties of cider apples suitable for general planting and others adapted to conditions in (1) Devonshire; (2) Gloucestershire, Herefordshire, Monmouthshire and Worcestershire and (3) Somerset are presented.

1814. Shay, J. R. and
Hough, L. F. 634.11–2.421.9–1.521.6(77.3)
Resistance to apple scab in certain clones of *Malus* species.
Phytopathology 1948 : **38** : p. 23. (Abst.).
Clones of *Malus* grown in Illinois were inoculated in the greenhouse with *Venturia inaequalis* and classified into four groups according to their reaction. The first group included *M.*

Toringo and *M. ioensis*, which showed no evidence of infection, *M. micromalus*, *M. floribunda* and 11 other clones, forming the third group, developed numerous or few pin-point depressions with no sporulation. Irregular necrotic or chlorotic lesions without sporulation were observed on *M. baccata* var. *Jackii*, *M. sikkimensis* and a Russian seedling. The fourth group consisting of *M. baccata* and three other clones, showed a few elongate or irregular, necrotic or chlorotic lesions; sporulation when present was sparse.
Inoculation of seedling F_1 progenies of crosses between eight of these clones and susceptible varieties indicated the heterozygosity and dominance of the genes determining resistance to *V. inaequalis*.

1815. LONGLEY, R. P. 634.11–2.421.9–1.521.6:575(71.6)
Notes from the experimental station.
84th Rep. N.S. Fruit Gr. Ass. 1947 : 105–12.

An account is included of past and present apple breeding investigations at the Nova Scotia Experiment Station.
The production of mutations by X-ray treatment and the possibility of securing scab resistance from various apples species are receiving attention.
Seedlings obtained by crossing the scab resistant Red Winter Reinette and the late maturing Black Ben Davis are being selected, in the attempt to develop a scab-resistant late maturing variety.

1816. HANSEN, N. E. 634.12:575:007(78.3)
Breeding of extra-hardy plants for cold climates.
Brooklyn Bot. Gdn Rec. 1948 : **4** : 9–13.

A brief account is included of the crab apples introduced and bred by the author since 1895 at Brookings, South Dakota. Reference is made to the following: the crab apples Dolga and Alexis selected from Russian introductions of *Malus baccata* var. *cerasifera*; Redvein (*M. pumila* var *Niedzwetzkyana*); Redflesh, developed from the cross Redvein x Elk River Minnesota wild crab (*M. ioensis*); Hopa, from Redvein x *M. baccata*; Red Tip, from *M. ioensis*); Hopa, from Redvein x *M. baccata*; Red Tip, from *M. ioensis* x Redvein; Almata; and Ata, from Sasha apple x Redflesh. Use of the crab apple Redvein in breeding work in other countries is also briefly described.

1817. 634.13:575.127.5:634.14
GUILLAUMIN, A. 634.13:575.257:634.14
Fruits de x *Pyronia* et de + *Pyro-Cydonia*. (**Fruits of x *Pyronia* and of + *Pyro-Cydonia***).
Rev. Hort. Paris 1945 : **29** : p. 165.

Artificial hybrids and graft hybrids between the pear and the quince are discussed. Their fruits are of no practical value.

1818. EVREINOFF, V.-A. 634.16:578.008
Le bibacier ou nèflier du Japon. (**The loquat or Japanese medlar**).
Rev. Hort. Paris 1944 : **29** : 133–37.

Descriptions of varieties of *Eriobotrya japonica* Lindl. are included.

1819. EVREINOFF, V.-A. 634.2:575.127.2:007
Notes sur les travaux d'hybridation du Docteur Hansen. (**Notes on the hybridization work of Doctor Hansen**).
Rev. Hort. Paris 1947 : **30** : 272–73.

Some of N. E. Hansen's work on the hybridization of plum and cherry trees in the United States is described.

1820 STOITSCHKOFF, I. P. [STOÏČKOV, I. P.] 634.2:581.162.5:582
(**Studies of incompatibility between some varieties of *Prunus divaricata, P. armeniaca* and *P. persica* and peach varieties grafted thereon**).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1. Agron. 1941–1942 : **20** : 189–218.

The varieties of peach used were the vigorous Elberta and the much less vigorous Hale. Premature cessation of growth of the scion was taken as a criterion for incompatibility.

Forty varieties of *P. cerasifera* (*P. divaricata* Ledb.) were tested as stocks and divided into four varietal types, viz. (1) greenish yellow, (2) yellow, (3) red and (4) violet. Incompatibility was found to be most marked in types (3) and (4) and in these types it becomes evident towards the end of the first vegetative period, whereas in types (1) and (2) it only becomes evident after the second or third vegetative period.
Twenty-two varieties of *P. armeniaca* were also tested as stocks. Incompatibility was noted in these cases too, especially in the case of the spherical, strongly pubescent types and the slightly pubescent types of *P. armeniaca*; the inhibition of growth of the scion became more marked in the second vegetative period; the oval varietal types showed incompatibility also in the second vegetative period. The degree of incompatibility depended also on the variety of peach, the same stock showing increased incompatibility with the less vigorous Hale.
Twenty-two varieties of *P persica* tested showed, with few exceptions, compatibility with Elberta and Hale.
Finally it was concluded that the reduction in the number of buds and in the set, in combinations which in the components are incompatible, can be used for early diagnosis of incompatibility. E. W.

1821. Genevois, L. and
Peynaud, E. 634.22:581.6(44)
Composition de neuf variétés de prunes. (**Composition of nine varieties of plums**).
Rev. Hort. Paris 1947 : **30** : 317–18.
Data are presented concerning the chemical composition of the following plum varieties: De Catalogne, Bonne de Bry, Monsieur, Des Bejonnières, Reine-Claude d'Althaud, Reine-Claude dorée, Impériale, D'Ente and Coe's Golden Drop.

1822. Renard, G. K. 634.22–1 524:582(47)
(Industrial and biological characters of the Omsk forms of *Prunus nigra* Ait.).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1946 : Nos. 7–8 : 34–38.
Some specimens of *Prunus nigra* Ait. were introduced into the U.S.S.R. in 1912 from the U.S.A. The collection received was a mixture and cross-pollination was allowed in raising seed as these plums are self-sterile. A detailed description is given of the morphological, physiological and economic characteristics, including resistance to unfavourable conditions, of the various types among the nursery material raised.
Of 16 types identified, three forms, Nos 16–38, 10–17 and 31–3, are regarded as ranking as varieties.

1823. Weinberger, J. H. 634.25:575(73)
The Dixired, Dixigem, and Southland peaches.
Circ. U.S. Dep. Agric. 1948 : No. 766 : Pp. 7.
Detailed descriptions are given of the peach varieties Southland (cf. *Plant Breeding Abstracts* Vol. XVII, Abst. 842), Dixired and Dixigem (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1748).

1824. Blake, M. A. and
Edgerton, L. J. 634.25:575(74.9)
Breeding and improvement of peach varieties in New Jersey.
Bull. N.J. Agric. Exp. Sta. 1946 : No. 726 : Pp. 20.
Peach breeding at the New Jersey Agricultural Experimental Station is described. Notes are included on the 32 named varieties which have been developed.

1825. Dorsey, M. J.,
Chaplin, C.,
Whitmore, J. S. and
Hough, L. F. 634.25:575(77.3)
New peach varieties on the Illinois Agricultural Experiment Station.
Fruit Varieties and Hort. Digest 1946 : **1** : 83–85.

Seven new peach varieties are described.

Prairie Daybreak (K69) is from a cross between Halehaven and Sunglow. In the midwest area it is fully freestone. The tree is vigorous and the buds about as hardy as Elberta. The fruits, which are large and well coloured with a red blush, ripen about five weeks before Elberta and a week after Red Bird. The flesh is light yellow and moderately firm; the quality is good to very good. Prairie Dawn (K73), a cross between Valiant and Halehaven, begins to ripen with Prairie Daybreak. The tree is vigorous and productive with hardy buds. The highly coloured fruit, which resembles Halehaven in appearance, has medium yellow, moderately firm flesh of good quality.

Another variety from the cross Valiant x Halehaven is Prairie Sunrise (K74) which resembles Prairie Dawn but ripens three to five days later. The tree is vigorous and very productive. The fruit quality is very good, the flesh being medium yellow and moderately firm. The variety is a freestone when fully ripened.

Prairie Rose (K80) from Gage x Halehaven has medium sized, well coloured fruit nearly spherical in shape with firm fine textured, medium yellow flesh which oxidizes very little during processing. Its season is three days to a week before Halehaven. Prairie Schooner (K40), a hybrid between Elberta and South Haven, ripens four or five days before or at the same time as Halehaven. The tree is vigorous and productive and bears large fruits with a red blush. Their flesh is a light yellow and moderately firm. This variety is suitable for freezing.

Prairie Clipper (K47), a seedling of J. H. Hale x Gage, ripens a little before or with Elberta. Its fruits are large, well coloured and spherical with firm flesh of good quality.

Prairie Rambler, a high quality freestone variety ripening three to five days after Elberta, was selected from a cross between Elberta and Gage in 1933. The large fruit is completely red when ripe and resembles J. H. Hale in shape. It has firm flesh.

1826. Blake, M. A. and
Edgerton, L. J. 634.25:578.088(74.9)
Standards for classifying peach characters.
Bull. N.J. Agric. Exp. Sta. 1946 : No. 728 : Pp. 53.

The identification of peach varieties is considered with reference to fruit-bud set and hardness, leaf form, the size and type of flower, and the character of the calyx, fruit and stone. The use of the criteria is exemplified by the description of the peach varieties developed at the New Jersey Agricultural Experiment Station.

1827. Genevois, L. and
Peynaud, E. 634.25:581.6(44)
Composition de 16 variétés de pêches. (**Composition of 16 varieties of peaches**).
Rev. Hort. Paris 1947 : **30** : 295–98.

Data are presented on the chemical composition of 16 peach varieties.

1828. Burkholder, C. L. 634.25–2.111–1.521.6(77.2)
Various strains of Shipper's Late Red peach.
Fruit Varieties and Hort. Digest 1946 : **1** : 52–53.

Several different varieties have been included under the name Shippers's Late Red. The Hale type of Shipper's has better quality than Elberta, is equally suitable for transport, has more red colour and extends the Elberta harvest season by three to five days. Another type of Shipper's Late Red closely resembles Elberta, and yet another very similar type is known as the Yates strain. This last outyields Elberta and, in some seasons, the fruit buds have been slightly more cold resistant. In the author's opinion only two strains of Shipper's

are worthy of propagation and distribution, the Yates strain (Elberta type) and the Dixie strain (Hale type).

1829. Goidànich, G. and
Ruggieri, G. 634.3–2.482–1.521.6
Il carattere della resistenza dei *Citrus* al parassitismo della *Deuterophoma tracheiphila* Petri. (**The character of the resistance of some Citrus species against the parasitism of *D. tracheiphila* Petri**).
Ann. Sper. Agrar. Roma 1947 : **1** : 473–84.

The ease with which spores of the fungus *D. tracheiphila*, the organism causing the dry rot [mal secco] of lemons, germinate in sap extracted from resistant and susceptible species was studied by inserting either conidia or pycnospores in a hanging drop of the extract, previously filtered through a Seitz microbiological filter. Control tests were made in drops of distilled water; in these the germination was very much slower than in sap from bitter and sweet oranges, both of which evidently contained substances which stimulated hyphal development. From this it is concluded that the resistance characteristic of the sweet orange is due to cytoplasmic rather than to purely chemical causes. The resistance of individual trees has in fact proved greater when they are in an actively growing state than during dormancy, when the cytoplasmic factors conditioning resistance are evidently partially suppressed. The interrelationships between host and parasite are also influenced by a number of environmental factors, and even in resistant forms such as the Monachello and Quattrocchi lemons, the sweet orange and Bergamotte, the fungus may make considerable penetration at certain times. At the height of the growing season however in such forms the plant grows away from the infection.

1830. Bartholomew, E. T. and
Sinclair, W. B. 634.31:581.6:575.42(79.4)
Bud selections and granulation.
Citrus Leaves 1947 : **27** : 8–11, also
Calif. Citrograph. 1947 : **32** : 94, 106, 123–24.

The results of previous studies on granulation of Valencia oranges are summarized.
Of buds from three trees producing a large percentage of granulated fruits and three giving only a small percentage, half were grown on sweet orange stock and half on sour orange stock. The degree of granulation of the fruits of the trees thus obtained was recorded. Only the annual percentages of granulated fruits, the averages of these and records of a few individual trees are reported in this paper.
The results were practically the same for buds from both categories of trees and for buds on both kinds of stocks in the case of buds from trees at Santa Ana, California, but results with buds from one tree belonging to each category at Riverside indicate that granulation may be decreased through bud selection, the root stock or other factors. It appears that the prevention of granulation through bud selection would be a matter of mere chance. Since there are no external symptoms of granulation, the detection of a mutant, arising from a bud or limb sport whose progeny would not produce granulation, would be very difficult, and even if such a mutant could be found its favourable qualities might be masked by other factors such as age and seasonal variations.

1831. Voltattorni, S. 634.38:576.312.32
Embriologia e cariologia di *Morus nigra* L. (**Embryology and caryology of *M. nigra* L.**)
Ann. Sper. Agrar. Roma 1947 : **1** : 149–56.

A description is given of the development of the embryo-sac and megaspore. The chromosomes are very thin and numerous and exact counts could not be made, the haploid number being given as $n = 43$–53, and the diploid number $2n = 89$–106. In view of the great difference in chromosome number between *M. nigra* and *M. alba*, ($2n = 28$), it is thought improbable that hybrids could be obtained between the two species.

1832 634.38:576.312.34
VOLTATTORNI, S. 634.38:576.354.56
Cariologia comparata di alcune varietà di *Morus alba* L. (**Comparative cariology of some varieties of *M. alba* L.**)
Ann. Sper. Agrar. Roma 1947 : **1** : 163–68.

Studies of the caryotype of several varieties of *M. alba* L. have shown the presence of 28 somatic chromosomes, two pairs of which are distinguishable by their greater dimensions. The variety Filippina, ascribed by some authors to a distinct species, *M. multicaulis*, differed in no way from the other varieties studied; the variety Limoncina however proved to be triploid and showed a sterility of 98–100%.

No tendency was observed for the homologous chromosomes distinguishable morphologically to pair together in somatic metaphase.

1833. VOLTATTORNI, S. 634.38:576.312.6
Fenomeni di citomissia osservati nella microsporogenesi di *Morus alba* L. (**Cytomixis phenomena observed in the microsporogenesis of *M. alba* L.**)
Ann. Sper. Agrar. Roma 1947 : **1** : 157–61.

Cytomixis has been observed in the pollen mother cells, the chromatin of which, together with the nucleolus, has been seen to pass into adjacent cells. It is observed, though more rarely, at other stages and some typical cases are illustrated.

1834. VOLTATTORNI, S. 634.38:576.354
Anomalie nella microsporogenesi di *Morus alba* L. (**Anomalies in the microsporogenesis of *M. alba* L.**)
Ann. Sper. Agrar. Roma 1947 : **1** : 169–79.

Male flowers of the white mulberry varieties Cattaneo and Selvatico were fixed in Navashin's fluid and in the vast majority of cases 14 regular bivalents were observed, though occasionally two and, more rarely, four or more univalents were detected. Various other slight meiotic irregularities were observed, such as delayed or precocious migration, anaphase bridges and non-disjunction of one or more bivalents; in extreme cases the non-disjunction applied to all bivalents and resulted in the formation of restitution nuclei, dyads and diploid pollen. These, it is thought, probably account for the relatively frequent occurrence of triploid forms among the varieties of *M. alba*. The second meiotic division was generally more regular and the germination percentage of the pollen was 48·5 in the variety Selvatico and 65 in Cattaneo.

1835. SPIELMAN, H. W. 634.42(8)
Jaboticaba—"Grape of Brazil".
Foreign Agric. U.S. Dep. Agric. 1948 : **12** : 18–19.

An account is given of the jaboticaba tree (*Myrciaria* spp.); it produces grape-like fruits which can be used as fresh fruit and for making jellies, wines and cordials. In the wild state the tree grows only in Southern Brazil. Introduced into the United States, the jaboticaba has grown fairly well in Southern Florida.

1836. RUEHLE, G. D. 634.42:575(75.9)
Promising new guava varieties.
Proc. Fla Hort. Soc. 1946 (1947) : **59** : 127–31.

The guava selections Supreme, Red Indian and Ruby, developed at the Sub-Tropical Experiment Station, Florida, are described.

Supreme is highly productive, under favourable conditions maturing some fruit over a period of eight months, with peaks of production in late autumn and early spring. The fruit is oval to broadly pyriform in shape, averaging 6–10 oz.; the skin colour of the ripe fruit is greenish yellow to light yellow, the flesh white. The seeds are small and few in number. The fruit quality is described as good; the variety is particularly suitable for domestic canning and preserving and for jellies. The average ascorbic acid content has been determined as 246·9 mgm. per 100 grm. of fresh fruit.

Red Indian has been developed from the introduction S.P.I.No. 57828; the introduction was originally obtained from Dominica, where it was taken from a variety introduced from

India. Red Indian is fairly productive, maturing its main crop in autumn and early winter. The fruit is globose in shape, averaging 4–8 oz.; the skin colour of the ripe fruit is yellow, often with a pinkish blush; the flesh colour varies from ruby to carmine. The seeds are numerous and small. The variety, which is said to be of good quality, is primarily a dessert guava. Its ascorbic acid content has been determined as 195 mgm. per 100 grm. of fresh fruit.
Ruby has been selected from the Peruvian introduction S.P.I. No. 81849. It is fairly productive, maturing its main crop in autumn and early winter. The fruit is ovate in shape, averaging 6–8 oz.; the skin colour is greenish yellow, often with a pinkish blush; the flesh colour of the fully mature fruit varies from rose to ruby. The seeds are relatively few. The fruit has very good quality, and is suitable as a dessert guava and for canning.
Other selections are under investigation, hybridization has been begun. The variety Redland is no longer recommended in Florida. Trials of Californian varieties have been carried out, but these guavas have so far proved inferior to the selections developed in Florida.

1837. 634.42:576.312.35:581.9
634.42:576.12
Atchison, E.
Chromosome numbers in the Myrtaceae.
Amer. J. Bot. 1947 : **34** : 159–64.
The chromosome numbers of various species of the Myrtaceae are given, including *Psidium* and *Eucalyptus* species investigated by the author. The evolution of the Myrtoideae and Leptospermoideae is discussed with reference to geological, geographical and cytological evidence.

1838. Morettini, A 634.451:581.162(45)
La biologia fiorale e di fruttificazione delle varietà del Diospiro o Kaki. (**The biology of flowering and fructification of persimmon varieties**).
Riv. Soc. Tosc. Orticult. 1947 : **31** : 109–22.
Brief descriptions are given of the main species of *Diospyros* cultivated in the Mediterranean basin, and of their floral characteristics. The majority of Italian varieties of *D. Kaki* have hermaphrodite flowers but are pollen-sterile. A certain number of monoecious plants occur but their fruit yield and quality are usually inferior.
Artificial pollinations of a number of varieties showed that in certain varieties the fruits became edible immediately after fertilization, whereas in others even fertilized fruits remained astringent for some time like parthenocarpic fruits. Two varieties are mentioned whose use as pollinators is recommended. One such tree is considered sufficient for every 30–40 female trees in an orchard.

1839. Acosta-Solis, M. 634.6:581.483(86)
Tagua or vegetable ivory—a forest product of Ecuador.
Econ. Bot. 1948 : **2** : 46–57.
An account is given of the tagua (*Phytelephas* spp.), the South American palm whose seed produces commercial tagua or vegetable ivory. Information is given on the Ecuadorian species, vernacular names, habitat and distribution, vegetative development, production, exploitation of the wild palms, insects and diseases, native and industrial uses, and the future economic possibilities of the tree. The author suggests that the experimental cultivation of tagua should be undertaken in Ecuador. Today the chief industrial use of the product is in the manufacture of buttons.

1840. 634.61:575.42(54.8)
Annual Report of the Coconut Research Scheme for 1944.
Ceylon 1948 : Sess. Pap. No. 1 : Pp. 20.
Recording of nut yields of selected mother coconut palms was continued on the Bandirippuwa Estate by the Department of Genetics and on private estates.
The Latin square experiment has now completed its fifth year after the transplantation of seedlings. Data on flowering, and the emergence and opening of the spathes are given for six different categories of seedlings. Selected seedlings derived from high yielding palms,

low yielders and from nuts of estate heaps show little difference in early flowering, and emergence and opening of the spathes, but as a group were superior to the corresponding classes of unselected seedlings.
A report is given of the behaviour of palms in experimental plantation No. 1, established in 1934, and consisting of the total progeny of nine high yielding mother trees.
Data are also included on the copra production of dwarf palms, and the average oil percentage of copra obtained from dwarf and tall palms.

1841. MORETTINI, A. 634.63:581.162
Gli "olivi a doppia fioritura" ed il noto fenomeno della prefioritura autunnale. (**Olives that flower twice and the well-known phenomenon of precocious autumn flowering**).
Ital. Agric. 1947 : **84** : 401–06.
Further observations were made on the two olives referred to in Abst. 1192.
A second flowering was never observed; the impression was created by the fact that the trees in question bear mixed inflorescences, containing branches as well as flowers, the fruits from which develop and ripen successively; they also show a tendency for small fruits formed from unfertilized flowers to persist and even swell slightly, which in later months also gives the impression that they are young fruits formed from a second flowering. True autumn flowering is sometimes seen in olives in Southern Italy and North Africa but not in Central Italy.

1842. CHEVALIER, A. 634.63:582:576.16
L'origine de l'olivier cultivé et ses variations. (**The origin of the cultivated olive and its variations**).
Rev. Bot. Appl. 1948 : **28** : 1–25.
The history and geographical distribution of olive cultivation are briefly indicated. All the olives cultivated as oil plants probably originated by hybridization between various forms described in this paper and by mutation. The classification and characteristics of the numerous varieties under cultivation are discussed.

1843. 634.63.00.14(82)
635.835.00.14(82)
Possibilités des plantes cultivées dans un milieu donné. Détermination de la spécificité des variétés. Observations faites dans le milieu argentin. Leur application éventuelle en France. (**Possibilities of plants cultivated in a given environment. Determination of the specificity of varieties. Observations made under Argentine conditions. Their possible application in France**).
C.R.Acad. Agric. Fr. 1947 : **16** : 695–700.
The adaptation of various olive and vine varieties to conditions in Argentina and the possible application in France of the results obtained are discussed.

1844. ROUNDS, M. B. 634.653(79.4)
The variety committee of the Californian Avocado Society.
Fruit Varieties and Hort. Digest 1946 : **1** : 94–95.
The characteristics to be desired in avocado varieties are enumerated. Varieties recommended for commercial planting in various districts of Southern California are Fuerte, Hass Nabal, MacArthur and Aneheim.

1845. RUEHLE, G. D. 634.653:575.42(75.9)
Report of the Avocado variety Committee.
Proc. Fla Hort. Soc. 1946 (1947) : **59** : p. 156.
The avocado seedling Kalusa, whose probable origin is given as W.I. x Guat, has been registered by the Avocado Variety Committee of Florida. It originated in the grove of F. A. Kalusa, near Homestead. It appears to merit further trial as an early variety with promising commercial characters.

1846. Li, L. Y. and
Toh, J. S. 634.653–1.524(51)
(The avocado and its possible culture in Fukien and Kwangtung).
Fukien Agric. J. 1947 : **8** : 23–28.
The dietary value, growth habit and methods of cultivation of the avocado (*Persea americana*) are discussed. The climatic conditions of Fukien and Kwangtung are compared with those of southern California, Florida, Auckland and other countries. The available data on the performance of the trees known to exist in the two provinces are reported. It is concluded that the species can be grown in these provinces in suitable soils and with proper shelter.
H. C. Y.

1847. du Preez, D. 634.653.00.14(68)
The avocado in the Western Cape Province.
Fmg S. Afr. 1948 : **23** : 21–27.
Avocado varietal trials carried out at the Western Province Fruit Research Station, Stellenbosch, are reported. Fuerte is the variety recommended for 80% of the avocado cultivation in Western Cape Province; other varieties recommended are Ward, Mayapan, Nabal and Itzamna.

1848. Darrow, G. M. 634.715–2.452–1.521.6(75.2)
Resistance of blackberries to cane rust at Beltsville, Maryland, 1947.
Plant Dis. Reporter 1948 : **32** : 5–6. (Mimeographed).
Information is given on the reaction of blackberry varieties and hybrid selections to *Kuehneola uredinis* at Beltsville, Maryland.

1849. Vaarama, A. 634.72:575.127.25
A triple species hybrid in the genus *Ribes*.
Hereditas, Lund 1948 : **34** : 369–70. (Abst.).
A hybrid was obtained by open pollination between a male plant of *R. alpinum* var. *pumilum* Lindl. and a female plant of *R. Culverwellii*, which is itself a hybrid between *R. nigrum* and *R. Grossularia* and is normally sterile. The hybrid flowered and was later killed by drought. Its morphological characters are described. The pistils were undeveloped and the pollen very variable in size. An attempt to cross the triple hybrid with *R. nigrum* was not successful.

1850. Evreinoff, V.-A. 634.72:576.16
Origine et ancêtres de nos groseilliers à grappes. **(Origin and ancestors of our currant bushes).**
Rev. Hort. Paris 1945 : **29** : 203–05.
The history of the cultivation and classification of the genus *Ribes*, its geographical distribution and the views of various authors on the origin of the cultivated currant are outlined. The present author's own opinion concerning this last problem is that the majority of varieties are derived from *R. vulgare* Lam. and a few from *R. rubrum*, L. while *R. petraeum* Wulfen and certain interspecific hybrids have also contributed to the origin of the cultivated varieties.

1851. Darrow, G. M.,
Wilcox, M. S.,
Scott, D. H., and
Hutchins, M. C. 634.75:577.16:575.12(73)
Breeding strawberries for vitamin C.
J. Hered. 1947 : **38** : 363–38.
Breeding experiments carried out in 1947 at Beltsville, Maryland, suggest that it is possible by breeding to increase to a considerable extent the ascorbic acid of the strawberry, The following varieties and hybrids were studied: Aberdeen, Fairpeake, Midland, US-2153, US-2153 x Aberdeen, US-2153 x Fairpeake, US-2153 x Oregon-1629, U.S.-2153 x Midland, Oregon-1629 x Midland x US-3280 x Howard 17.

1852. Robinson, W. B.,
Lee, F. A., 634.75:581.192
Slate, G. L. and 634.75:577.16
Pederson, C. S. 634.75:581.6
Chemical composition and freezing adaptability of strawberries.
Bull. N.Y. St. Agric. Exp. Sta. 1947 : No. 726 : Pp. 14.

The results of analysing over 300 strawberry varieties and seedlings for ascorbic acid content, colour, soluble solids, free acids and *p*H value are reported. Tests were also carried out on 35 named varieties with regard to their suitability for freezing. The ascorbic acid content over 80% of the varieties tested ranged between 50 and 80 mg. per 100 grm. of fresh fruit. Julymorn, Marshall, Redheart, Redwing, Sparkle and Vanrouge were found to be the most satisfactory varieties for freezing purposes. No relationship was noted between suitability for freezing and any of the chemical properties analysed.

1853. McClintock, J. A. 634.75–2.4–1.521.6(77.2)
Spraying for strawberry fruit rots in 1946.
Hoosier Hort. 1946 : **28** : 147–48.

In experiments carried out at Lafayette, Indiana to determine the effect of spraying with wettable sulphur on the fruit rotting of 15 strawberry varieties, differences in the amount of rotting between different varieties were greater than the differences in rotting shown by unsprayed and sprayed fruit of any given variety. Soft fruited varieties such as Premier, Dunlap, Majestic and Tennessee Beauty each had a higher percentage of rotten fruit than Dorsett, Blakemore and Robinson. Fairfax, Tennessee Supreme and Ambrosia ripened relatively late and yielded lightly at the first picking. Subsequent pickings showed no fungus control from spraying.

More than one fungus was responsible for the fruit rot but most of the decayed fruits were infected with *Botrytis*.

1854. Gilbert, F. A. 634.75–2.411.4–1.521.6(74.9)
New strawberry variety for New Jersey growers.
Hort. News N.J. 1948 : **29** : p. 2017.

The new strawberry variety N.J. 377 is to be distributed in 1948 for trial by growers. It has been developed from the cross Aberdeen x Fairfax at the New Jersey Experiment Station, and is recommended for southern and northern New Jersey. It gives good yields of firm attractive berries, which are without a hollow centre cavity. The variety has so far shown resistance to red core.

1855. Reid, R. D. 634.75–2.411.4–1.521.6:575(41)
Strawberry breeding at Auchincruive.
Scot. Agric. 1948 : **27** : 218–23.

An account is given of strawberry breeding for resistance to red core root rot (*Phytophthora Fragariae*) at Auchincruive, Lanarkshire. This work was begun in 1933. Selection No. 52, believed to be a strain of the variety Frith, and the American strawberry Aberdeen have formed the chief sources of resistance. The method of testing for resistance is described. Resistance is inherited as a dominant character and it appears that more than one factor is necessary to give a high degree of resistance. Use of *Fragaria chiloensis* has generally depressed the level of resistance to a considerable extent. *F. virginiana* appears to increase resistance. Selections from crosses involving the latter have, however, failed to combine satisfactory fruiting characters with the increased resistance obtained, but breeding is being continued in the fourth generation.

The varieties commercially released include the following: Auchincruive 1, 2, 4, 5 and 6, not completely immune from red core but more resistant than the older varieties; LR 19, released in 1945, susceptible to red core and also sensitive to yellow edge virus; and Auchincruive Climax, released in 1947. Auchincruive Climax is a maincrop strawberry, with firm fruit of excellent quality. It has been derived from a cross between Aberdeen and an F_3 seedling from No. 52. It has so far proved resistant to red core; it also appears to be highly virus resistant. It is fairly susceptible to the conditions of spring dwarf, generally attributed to eelworm.

The problem of the breakdown in resistance to red core is discussed.

A bibliography is appended

1856. LARTER, L. N. H. 634.771:575(72.92)

Report on banana breeding.

Bull. Dep. Agric. Jamaica 1947 : No. 34 : Pp. 24.

Past and present breeding work on the banana in Jamaica is surveyed, and future breeding policy is outlined. A useful bibliography, mostly of genetical and breeding investigations on the banana in Jamaica and at the Imperial College of Tropical Agriculture, Trinidad, is included.

The breeding programme in Jamaica has aimed at the production of seedling varieties combining resistance to Panama disease [*Fusarium oxysporum* Fr. var. *cubense* (E. F. Sm.) Wollenw.] and *Cercospora* leaf spot with the commercial characteristics of Gros Michel. A large number of tetraploid seedlings from primary crosses between the triploid variety Gros Michel as female parent and wild diploid species and types immune from Panama disease has been studied. The seedlings of interest have all been secured from crosses of Gros Michel and its varieties Highgate and Pink Jamaica with various clonal varieties of *Musa acuminata*.

Descriptions are given of the technique of pollination, germination, propagation and selection of the seedlings in the first, second and third generations of growth, including field selection for Panama disease resistance, varietal trials, and tests of suitability for cold storage and shipping.

The characteristics of seedlings from primary crosses involving the Zebrina A, Calcutta and Pisang Lilan types of *M. acuminata* are given.

Considerable segregation of inherited characters occurs in the F_1 generations of the primary crosses. It is therefore necessary to raise families of 100 to 300 seedlings in order to explore fully the possibilities of a primary cross. Resistance to Panama disease approaching immunity and resistance to *Cercospora* leaf spot behave as dominant characters; in most crosses 50% or more of the progeny prove to be immune from Panama disease for practical purposes.

Back-crossing the F_1 tetraploids of primary crosses to Gros Michel cannot be applied in banana breeding, since abnormal pentaploid seedlings result. While being of little immediate economic value, the triploids derived from the back-cross of the F_1 to the diploid wild type may prove useful in the development of improved male parents.

Secondary tetraploids produced by crossing primary tetraploid F_1 seedlings have not been found to be of any immediate economic value.

The results of variety trials and tests of the suitability for cold storage, shipping and marketing of existing seedlings are expected to confirm the view that seedlings have now been developed which are commercially immune from Panama disease and highly resistant to *Cercospora* leaf spot, and not inferior to Gros Michel in grade and weight of stem, flavour, texture, colour and suitability for shipping, but which do not develop such a long or heavy finger. Further improvement in finger length is now being sought. The possibilities of securing a longer fingered male parent are being explored. Seedlings from crosses of Gros Michel with Pisang Lilan and Burma 7 are available for study in this respect. It is hoped that Long Tavoy, derived from an introduction from Burma, will be valuable as a male parent; it is now under selection for finger length and other characters prior to introduction in the breeding programme. The suggestion is also made that seedlings from the cross Highgate x Pisang Lilan should be studied, in the hope of securing seedlings with better grades and more compact stems than those from Gros Michel x Pisang Lilan, although the seedlings are likely to be shorter fingered. Highgate should also be a valuable parent in crosses with the satisfactory long-fingered male parent which it is hoped will eventually be found.

Various possible methods of developing improved diploid and triploid male parents are discussed, in addition to the method touched upon above, of back-crossing seedlings from the cross Gros Michel x diploid wild type to the male parent to obtain triploids. These triploids could be similarly back-crossed to produce diploids for use in crossing with Gros Michel. Attention is drawn to the importance of wild *Musa* species as breeding material from which improved male parents may be secured.

Other fields of investigation recommended include: (1) more intensive cytological study in the course of breeding work; (2) genetical analysis of interfertile diploid wild types to

supplement the incomplete data obtained on the inheritance of characters in polyploid bananas; (3) the environmental factors affecting seed set; (4) an improved technique of germination; (5) the development of a greenhouse or pot technique to test the resistance of young seedlings to Panama disease; (6) histological and physiological investigations on the nature of fruit bruising, with a view to facilitating selection; (7) a more rapid technique of vegetative propagation than the present one of natural suckering; and (8) the response of seedling varieties to fertilizers.

1857. 634.771:576.356:575.127.2(54+91)
634.771:581.163:575.11(54+91)
DODDS, K. S. and 634.771:576.356.5(54+91)
SIMMONDS, N. W. 634.771:576.16(54+91)
Genetical and cytological studies of *Musa*. IX. The origin of an edible diploid and the significance of interspecific hybridization in the banana complex.
J. Genet. 1948 : **48** : 285–92.

A hybrid banana, S.H. 62, obtained by crossing *M. Balbisiana* Colla, I.R. 100, with the edible diploid I.R. 143, regarded as a parthenocarpic form of *M. acuminata* Colla, is compared, phenotypically, with its parents and with type 20, an established edible diploid which it is shown to resemble closely. Type 20, however, forms fewer bivalents than S.H. 62, probably as a result of the accumulation of structural hybridity in its chromosomes during the course of its clonal existence. Thus the cytological data are not inconsistent with the hypothesis that type 20 and S.H. 62 are of similar origin. It is thought that type 20 arose by parthenogenesis from hybridization between *M. Balbisiana* and *M. acuminata*. Four siblings of S.H. 62 are phenotypically similar to it except in certain fruit characters. They segregated with respect to a dominant gene for parthenocarpy (*P*) for which I R. 143 is heterozygous.

The bispecific ancestry of the Indo-Malayan group of cultivated bananas and the frequent origin of triploidy within the group are discussed.

1858. CHEESMAN, E. E. 634.771:582:001.4(54+91)
On the nomenclature of edible bananas.
J. Genet. 1948 : **48** : 293–96.

The nomenclature of the edible bananas is discussed in view of the fact that an edible banana resembling a clone already in existence has now been produced by crossing *Musa Balbisiana* Colla with *M. acuminata* Colla, thus supporting the classification of the Indo-Malayan group into three divisions according to their putative derivation from *M. Balbisiana*, *M. acuminata* or both.

1859. KERNS, K. R. and
COLLINS, J. L. 634.774:581.04:576.356.5(96.9)
Chimeras in the pineapple. Colchicine-induced tetraploids and diploid-tetraploids in the Cayenne variety.
J. Hered. 1947 : **38** : 323–30.

Tetraploid plants and periclinal chimaeras were produced as the result of treating growing points of the pineapple variety Cayenne with colchicine in experiments at the Pineapple Research Institute, Hawaii. The periclinal chimaeras were of two kinds; some had only the epidermis tetraploid, the deeper lying tissues being diploid, while others possessed a diploid epidermis and tetraploid subepidermal tissues. These observations support the results of histological work by B. Krauss, shortly to be published, which revealed that in the pineapple only two distinct germ layers of cells are produced from the undifferentiated apical meristem.

In comparison with the diploid plants the tetraploids had smaller fruits, fewer but larger eyes, a lower Brix value of the fruit, fewer but wider leaves, a more intense bloom on the leaves, a lower percentage of dry matter content in the leaves, longer stems, later maturity, larger stomata and larger pollen grains.

The tetraploid fruits were seedless, thus resembling the diploid fruits. Doubling of the chromosome number therefore apparently exerted no effect upon the self-incompatibility of the diploids.

1860. 634.8–2.7–1.521.6:581.165.711:575.127.2(93.1)
Phylloxera-resistant vines.
Bull. N.Z. Dep. Agric. No. 276 : Pp. 16.
Phylloxera-resistant stocks of various origin which are available in New Zealand are described. The chief stocks used for grafting are mostly hybrids of American species and hybrids between *Vitis vinifera* and American species.

1861. Bruni, B. 634.835 Ciliegiuolo
Il problema ampelografico e il caso del Ciliegiuolo. (**The ampelography problem and the case of Ciliegiuolo**).
Ital. Agric. 1947 : **84** : 109–11.
Reference is made to the note by Dalmasso (cf. Abst. 1862) and to a number of resemblances between the Ciliegiuolo vine and the variety Sangiovese, of which it is thought to be a synonym or a subvariety. The case is taken as illustrating the need for accurate studies of the synonymy of Italian vine varieties.

1862. Dalmasso, G. 634.835 Ciliegiuolo
Ancora sul "Ciliegiuolo" e sul problema ampelografico. (**Once more the Ciliegiuolo vine and the problem of ampelography**).
Ital. Agric. 1947 : **84** : p. 348.
Referring to the remarks of Bruni (cf. Abst. 1861) the author points out that the question whether the vine Ciliegiuolo is the same as Sangiovese can only be decided by comparative studies and suggests that these should be undertaken.

1863. Stoeff, K. [Stoev, K.] 634.835:575.12:581.165.711:578.08
(The carbohydrate reserves of American vine stocks and their importance in rooting).
Annu. Univ. Sofia V. Fac. Agron. Syivicult. Livre 1.—Agron. 1945–1946 : **24** : 103–44.
The extent to which ringing promotes root development in the following hybrid stocks is examined: Berlandieri x Riparia Kober 5 BB, Berlandieri x Riparia 420 A, Chasselas x Berlandieri 41 B, Berlandieri x Riparia 33 EM and Berlandieri x Riparia 34 EM.

1864. Leyvraz, H. 634.835:575.42(49.4)
Sélection du Chasselas. (**Selection of the Chasselas vine**).
Publ. Sta. Fédérale Essais Viticoles Arboricoles, Montagibert, Lausanne 1947 : No. 359 : Pp. 14.
An account is given of 25 years' selection work carried out on vines of the Chasselas type.

1865. Stoeff, K. [Stoev, K.] and
Radoutcheff, S. [Radučev, S.] 634.835:578.088(49.7)
(On the method of description of the vine leaf according to its measurements).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1944–1945 : **23** : 145–63.
The importance of an exact method of describing the vine leaf as a means of identifying the variety is stressed, and the problems which arise, especially in connexion with the changes the leaf undergoes during development, are discussed with reference to the Bulgarian vines, Gămza, Černo Meko, Zarčin and Prokupac.

1866. Stoeff, K. [Stoev, K.]
Radoutcheff, S. [Radučev, S.] 634.835:578.088(49.7)
(A description of the leaves of some Bulgarian vine varieties according to their measurements).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1942–1943 : **21** : 177–206.
Data concerning the size and shape of the leaves of four Bulgarian vines, Bolgar (Dattier de Beyrouth), Pamid, Mavroud and Dimiat are presented, and are interpreted statistically with the aim of determining the typical leaf form for each variety.

1867. STOEFF, K. [STOEV, K.] and
RADOUTCHEFF, S. [RADUČEV, S.] 634.835:578.088(49.7)
(Description of the leaves of the vine varieties Gămza, Cerno Meko, Zarčin and Prokupac according to their measurements and an attempt to establish their synonymy).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Libre 1.—Agron. 1944–1945 : **23** : 165–80.
A study of the leaf characters of comparable leaves of four vines, all grafted on to Mourvèdre x Rupestris 1202 and grown under similar conditions, is reported. The results show appreciable differences both between Gămza and Černo Meko and between Zarčin and Prokupac and do not therefore support the conclusion that these vines are synonymous.

1868. LEYVRAZ, H. 634.835:581.165.711:575.42(49.4)
Production indigène de bois porte-greffes. **(Home production of stocks).**
Publ. Sta. Fédérale Essais Viticoles Arboricoles, Montagibert, Lausanne 1947 : No. **356** : Pp. 8.
The selection of vine stocks in Switzerland is discussed.

1869. NEDELTCHEFF, N. [NEDELČEV, N.] and
RADOUTCHEFF, S. [RADUČEV, S.] 634.835:581.165.711:581.43
(Observations on the rooting of certain vine stocks).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1944–1945 : **23** : 191–201.
The number and quality of roots produced by cuttings of different varieties of vine stocks are compared.

1870. RADOUTCHEV, S. [RADUČEV, S.] 634.835:581.45:582
(An attempt to determine the distinctive characters of vines pertaining to the description of the vine leaf).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1945–1946 : **24** : 229–62.
Some of the linear dimensions of the vine leaf are shown to be partially determined by environmental conditions. Other leaf characters are constant and are therefore of taxonomic value.

1871. NEDELTCHEFF, N. [NEDELČEV, N.] and
KONDAREFF, M. [KONDAREV, M.] 634.835:581.6(49.7)
(A study of the wines of Mavroud and of colouring vines).
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1.—Agron. 1941–1942 : **20** : 41–49.
A comparative study of samples of wine from the vines Alicante Bouschet, Grand Noir, Boïa, Mavroud and Hybrid No. X 14, with special reference to their colour intensity, leads to the conclusion that the best wines for blending are obtained from Boïa, hybrid No. X 14 and Alicante Bouschet; the two last named are both productive varieties.

1872. FENNELL, J. 634.835:581.6:575.127.2(21.3)
La uva tropical. **(The tropical grape).**
Rev. Agric. Guatemala 1946 : **2** : Nos 15–20 : 25–37.
In order to breed grapes adapted to tropical conditions, advantage has been taken of the following wild species: *Vitis Shuttleworthii*, the Calloosa grape which bears large berries; *V. gigas*, the Florida Blue grape, a species with superior quality, high sugar content, and outstanding resistance to disease; the *V. tuftotomentosa–V. Smalliana* complex; the *V. tiliaefolia–V. caribaea* grapes, which are well adapted to the torrid zone; *V. Simpsonii*, a species which is able to tolerate water-logged soils; and *V. Popenoei* and *V. Munsoniana*, two muscadine types. The author describes his extensive work on the selection of these species and on hybridization, both between themselves and with standard varieties. The new varieties Trópico, Marco and Wachula are described in detail (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1419).

1873. NYSTERAKIS, F. 634.835–2.8–1.521.6 : 577.17
Nouvelle interprétation du mécanisme du rabougrissement (court-noué) des vignes. [**New interpretation of the mechanism of stunting (court-noué) of vines**].
Rev. Hort. Paris 1947 : **30** : 306–15.
The stunting of vines has been found to be caused by the disturbance of the balance of hormones in the plants as a result of either a parasite or a non-parasitic agent. It is thought that varietal differences in susceptibility to the disease are dependent on the inherited sensitivity of the cells to phytohormones or the facility with which the hormonal balance can be upset, and that these differences should be taken into account in future vine breeding work.

1874. DEARING, C. 634.848(73)
Muscadine grapes.
Fmrs' Bull. U.S. Dep. Agric. 1947 : No. 1785 : Pp. 29.
The bulletin includes descriptions of the most important varieties of muscadine grapes grown in the south-eastern United States.

FORESTRY 634.9

1875. GUINIER, P. 634.97:575(44)
Génétique et sylviculture. (**Genetics and forestry**).
Livret du cinquantenaire 1946. Soc. For. Franche-Comte Prov. l'est Lons-le-Saunier 1947 : 15–42.
The development of genetical ideas up to the present time is briefly traced and the application of genetics to forestry in France discussed.

1876. 634.97:575(47)
Afforestation of steppelands.
Soviet News 1948 : No. 1879 : p. 3.
Brief mention is made of the breeding work of the Scientific Research Institute of Forest Amelioration of the U.S.S.R. A number of rapidly growing varieties have been developed; among these is a poplar variety which grows 50 ft. high in ten years. The Institute has also obtained hybrids which grow well under dry climatic conditions. These will be valuable in the afforestation of the steppe.

1877. 634.97:575.1(48.5)
Berättelse över verksamheten vid statens skogsforskningsinstitut under år 1946. (**Report on the work of the National Forestry Research Institute during 1946**).
Medd. Skogsforskinst. 1947 : **36** : No. 8 : Pp. 10.
A department of genetics was established on 1 July 1946 at the Swedish National Forestry Research Institute, with O. Langlet as director of research. The past and future research programme of the Institute is discussed.

1878. WRIGHT, J. W. 634.97:575.12:578.08(74.8)
Tree breeding at the Arboretum.
Morris Arbor. Bull. 1948 : **4** : No. 8 : 63–64.
The bagging and pollination methods used in breeding work on timber trees at the Morris Arboretum, Philadelphia, are described.

1879. RIKER, A. J. 634.97–2–1.521.6:575(73)
Some possibilities for developing resistance to disease in trees.
Arborist's News 1945 : **10** : 52–56.
The usual methods of breeding disease resistant plants are outlined and some examples of tree breeding for disease resistance in the United States are cited.

1880. 634.972.1:575.127.2(48)
634.972.1:575.22(48)
WEIMARCK, H.
De nordiska ekarna (**The northern oaks**).
Bot. Notiser 1947 : 61–78, 105–34.

A description is given of the degree of variation and geographical distribution in Scandinavia and Finland of the polymorphic oak complex comprising *Quercus Robur* subsp. *pedunculata*, *Q. Robur* subsp. *puberula*, *Q. petraea* and *Q. petraea* x *Q. Robur*.

1881. PYATNITSKII, S. S. [PJATNICKIĬ, S. S.] 634.972.1:581.331.2:578.08
(**Storing oak pollen**).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1947 : No. 3 : 32–35.

Pollen from various *Quercus* species was germinated in distilled water and sucrose solutions varying from 0·2 to 1·6 normal. For species of the sections *Cerris*, *Mesobalanus* and *Lepidobalanus* the best germination occurred in solutions of 0·4 to 0·6 N., for the species *Q. borealis* in 1·0 N. Good germination was obtained only when some stimulator such as a style or style extract, a 0·001% boron solution, folliculin or certain plant tissues was added to the nutrient medium.

The pollen retained its viability longest when kept at low temperatures (0° C.) in desiccators containing 35% H_2SO_4, under which conditions it lasted for 66 days or more.

1882. CAMUS, A. 634.972.1:582(51)
Fagacées nouvelles de l'Asie orientale. (**New Fagaceae from eastern Asia**).
Bull. Soc. Bot. Fr. 1947 : **94** : 270–71.

Five new Chinese species of *Lithocarpus* are described: *L. cheliensis*, *L. Wangiana*, *L. cuneiformis*, *L. oleaefolia* and *L. fohaiensis*.

1883. DESMARAIS, Y. 634.972.2:582:575.12
Taxonomy of the sugar maples.
Amer. J. Bot. 1947 : **34** : p. 606. (Abst.).

The section *Saccharina* Pax is divided into three main groups and a number of intermediate forms which appear to be hybrids.

1884. 634.972.3:575(49.2)
Verslag over het jaar 1946. (**Report on 1946**).
Meded. Ned. Heidemaatschappij 1947 : No. 3 : Pp. 34.

The Dutch Heathland Society records that poplar breeding was continued in co-operation with Haning and Westerdijk, but no details are reported. C. B.

1885. WETTSTEIN, W. v. 634.972.3:575.127.2:581.6(43)
Die "Zellulosepappel". Ihre Kultur und Züchtung. (**The cellulose-yielding poplar. Its cultivation and breeding**).
Züchter 1946 : **17–18** : 13–19.

Varieties were grown of *Populus serotina* from Garzin, *P. robusta* from Schönfliess and a new form *P. angulata* x *P. serotina* N 8/33 Wettstein. After four years a great increase in the yield of cellulose was found; the new form 8/33 gave, also, a remarkably high figure for yearly growth. There is no correlation between cellulose content and rate of growth. During tests on the relation of spacing to the production of cellulose, the varieties from Schönfliess and Garzin and the form 8/33 gave cellulose contents of 44%, 42% and 47% respectively after the second year; in later years the increase in cellulose was at most only about 2%.

Ten years after planting, the crosses *P. tremula* x *P. tremula*, *P. alba* x *P. tremula* and *P. tremula* x *P. alba* showed the superior growth of the hybrids. In a back-cross between *P. canescens* x *P. tremula* many plants proved non-viable and growth was very irregular.

P. serotina is recommended for testing the quality of soil.

Fourteen varieties of poplar were tested to find out whether they were of short day or long day type. Certain forms were proved to be indifferent to length of day as regards their increase in growth. The Swedish triploid aspen, a species needing the long day, begins to show decrease of growth in August and is therefore less satisfactory for wood and cellulose production than hybrids of central-European origin. E. W.

1886. 634.972.3–2.3–1.521.6(42)
634.975–2.111–1.521.6:578.08(42)
634.975–2.7–1.521.6(42)

Twenty-third Annual Report of the Imperial Forestry Institute, University of Oxford, for the academic year, 1946–47 (1948) Pp. 23.

The investigations reported include refrigerator tests on the frost susceptibility of European larch of different provenances. The experiments on samples from the region including the Alps and Sudeten mountains have indicated marked differences in susceptibility to frost between trees of different origin. They also suggest that if the elevation of the provenances is the same, susceptibility decreases as the latitude becomes more northerly, and that if the elevation and latitutude are similar, susceptibility is highly correlated with date of flushing. The material was not adequate to test the variation in susceptibility with change in elevation, but it is thought that a direct correlation exists. Limited experiments have suggested that susceptibility to irreversible plasmolysis is directly correlated with frost injury.

A lot of European larch from Scotland also tested proved to be one of the more susceptible samples. Other material tested included two lots of Japanese larch and one lot from Denmark. Apparently different strains of Douglas fir have shown differences in severity of infestation by *Adelges* Possible causes of these differences in severity of attack are under investigation.

It has been found that susceptibility to frost injury is a factor which must be considered in investigating the causes of differences in the susceptibility of Lombardy poplar strains to bacterial canker.

1887. Vénot, P. 634.972.4:575.12(44)

A la recherche d'un porte-greffe du châtaignier. (**In search of a chestnut stock**).

Rev. Hort. Paris 1947 : **30** : 366–69.

The technique of hybridization of the chestnut is described. The aim of the work at Brive is to obtain a hybrid exhibiting both disease resistance and fertility which can be used both as a wood producer and as a stock.

1888. Went, J. C. 634.972.8–2.421.9–1.521.6:575

Inoculatie van de enten en zaailingen der minst gevoelige iepennummers en bastaarden met *Ceratostomella ulmi*. (**Inoculation of grafts and seedlings of the least susceptible elms and hybrids with *C. ulmi*).**

Verslag. Inst. Toegepast Biol. Onderzoek Natuur 1946 (1947) : Mededeeling No. **5** : 19–30.

This is a progress report of the Committee for Studying and Combating Elm Disease and Diseases of other trees, and records the results of inoculation tests on seedlings grown at Wageningen in 1936–9 and selected for resistance to *C. Ulmi*, and on grafts made from them. Seven seedlings from as many crosses remained healthy throughout the five to nine years of testing.

The crosses giving the greatest number of resistant offspring are *Ulmus hollandica* var. *vegeta* x *U. foliacea* No. 1 and *U. foliacea* No. 28 x No. 1. The numbers of grafts in each case were too small to warrant any conclusions. Besides the two crosses mentioned, the following are reported: *U. hollandica* No. 5 selfed, *U. Horsholmensis* selfed, *U. japonica* x *U. foliacea* No. 1, *U. pumila pinnato ramosa* x *U. hollandica vegeta* and x *U. Horsholmensis*, and *U. Wallichiana* x *U. foliacea* No. 1.

Results of inoculating grafts of two *U. pumila* hybrids show very low incidence of the disease, but the plants resemble *U. pumila* too much, and, like *U. foliacea* No. 43, are retained only as breeding parents. *U. pumila* and *U. foliacea* No. 28 may be relied on to produce resistant offspring.

In crosses made in 1945 and 1946 the parents used were those whose offspring had shown a high degree of resistance in previous years, e.g., *U. hollandica vegeta*, *U. foliacea* No. 1 and No. 28, and *U. glabra* No. 49. Elms showing a high degree of resistance themselves were also used, and also the hybrids of 1937–9, which were just beginning to flower. The 1945 offspring of *U. foliacea* are classified according to the size of their leaves.

After inoculation of *U. foliacea* No. 62 with *Nectria cinnabarina* (Tode) Fr., out of 30 trees inoculated, only four showed signs of the disease. It appears that No. 62 is very resistant to the fungus.
A note is given regarding synonyms of the species mentioned. C. B.

1889. Eklundh Ehrenberg, C. 634.973:575.127.2(48.5)
Till frågan: existerar *Alnus glutinosa* x *incana* i naturen? (On the question: does the hybrid *A. glutinosa* x *A. incana* exist in nature?)
Bot. Notiser 1946 : 529–35.
A cytological examination of trees intermediate morphologically between *A. glutinosa* and *A. incana* and occurring together with the typical species at Brunsberg and Lund has revealed that meiosis is hardly less regular than in the typical species. It is uncertain therefore whether the intermediate forms are merely varieties of one or other of the parents, or are hybrids in which the genomes from each parent are closely homologous.

1890. 634.973–1.524(47)
Eucalyptus cultivation in Abkhazia.
Soviet News 1948 : No. 1895 : p. 3.
Eucalyptus varieties suitable for cultivation in Abhazia, on the Black Sea coast, have been developed, and are to be planted during 1948 in this region. Their timber possesses the valuable properties of the Australian prototypes. An adapted form of the Australian lemon eucalyptus has also been selected; this eucalyptus produces a valuable essential oil.

1891. Sterling, C. 634.975:576.37
Gametophyte development in *Taxus cuspidata*.
Bull. Torrey Bot. Cl. 1948 : 75 : 147–65.
An account is given of the development of the male and female gametophytes and of fertilization in *T. cuspidata*.

1892. Johnson, A. G. 634.975:581.143.7:575.061.634(77.5)
Albinism in the Austrian pine.
J. Hered. 1948 : 39 : 9–10.
Seeds of an isolated specimen of *Pinus nigra* var. *austriaca* gave rise to normal and albino seedlings in a ratio closely approximating to 3 : 1.
Another lot of Austrian pine seeds, collected from an individual growing in a group of trees of this variety, produced abnormally pigmented seedlings in a ratio of 112 normal: 13 deficient. The deficient seedlings had normally pigmented cotyledons but the primary needles are almost without green colouring. Controlled pollination experiments are to be carried out on the parent trees.
Albino seedlings were observed among the seedlings obtained from purchased seed of *P. Peuce* and *P. Jeffreyi*.

1893. Stefanoff, B. [Stefanov, B.] 634.975:576.16:581.9
(The geographical distribution of the conifers and the production of forms in nature).
Annu. Univ. Sofia V. Fac. Agron. Sylvicult. Livre 2. Agron. 1939–40 : 18 : 173–212; 1940–41 : 19 : 1–56, 251–313; 1941–1941 : 20 : 1–69.
The geographical areas of distribution of the genera and species of the Coniferales were studied.
The composition of the families Pinaceae, Cupressaceae and Taxaceae is shown to coincide largely with the genetic relations of the individual genera and with the various possible directions along which the individual members of these Conifer groups have developed. Apart from this, the author does not consider these three families to be natural systematic units, but only collective groups of cone bearing types. The origin of separate systematic units within the natural or genetic groups is considered to be geographical fractionation of the original area of distribution and the subsequent geographical isolation of the newly produced forms. The discontinuities in the geographical areas of distribution of forms belonging to the same natural group show that the occurrence of new forms and even new types cannot be due to mutation. Since crossing between species of Coniferales is extremely

rare and resulting hybrids are locally distributed and very short-lived, it is impossible to regard hybridization as having been a factor in the production of new forms and types.

E. W.

1894. Blair, J. H. 634.975–1.524(41+42)

The Polish larch.

Scot. For. 1948 : **1** : Nos. 3–4 : 21–25.

An account is given of the Polish larch (*Larix decidua* var. *polonica*), including its botanical characters and growth in Poland and other European countries. Plots of the tree at Blairquhan, South Ayrshire, Scotland, which have been produced from seed introduced in 1931, are making vigorous growth and have shown promising winter hardiness. Extended trial of the Polish larch in Great Braitain is recommended.

VEGETABLES 635

1895. 635(72.9+8)

Vegetables in the Caribbean.

Caribbean Comm. Cttee Agric. Nutrit. Fish. For. Caribbean Res. Coun. 1947 : Crop Inquiry Ser. No. 5 : Pp. 87.

Prepared by the Caribbean Research Council which was established by the Anglo-American Caribbean Commission in 1943, this publication surveys the production of vegetables, exclusive of root crops and legumes, in the Caribbean territories of Great Britain, the Netherlands and the United States. Information is given on varieties, seed supply, organization of production, ecological conditions, diseases and pests, research and other topics for each of the territories. A separate survey deals with root crops and legumes (cf. Abst. **1664**).

1896. Carson, C. M. 635(73)

Preview.....1949 All-Americas.

Sth. Seedsman 1948 : **11** : No. 3 : 14–15.

The following vegetable varieties are to be introduced commercially in 1949, as a result of the decisions of the All-America Selections Committee: Bush Lima Bean Triumph (cf. Abst. **1944**); the lettuces Pennlake and Penn State Great Lakes, produced at the Pennsylvania State College; the radish Cherry Belle (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. **1790**); the cauliflower Ideal Snowball, developed by H. Fricker, Lucerne, Switzerland, and introduced into the United States by Bodger Seeds, Ltd., California; the tomato Wisconsin 55; the sweet corn Flagship, introduced by the Cornell Seed Co.; and a white-seeded stringless snap bean, developed and distributed by the Ferry-Morse Seed Co. considered to be superior to Sure Crop Wax developed and distributed by Ferry-Morse Seed Co.

1897. Scott, G. W. 635:581.6(79.4)

The selection of varieties for the production of frozen fresh vegetables.

Amer. Fruit Prod. and Amer. Food Mfr. 1946 : **26** : 112–13.

The importance of choosing the most suitable varieties of vegetable for freezing and the need for research into the characteristics of the various varieties are emphasized.

1898. 635:582

Nos choux cultivés: leurs relations génétiques et la nomenclature moderne. (**Our cultivated forms of *Brassica*: their genetical relationships and modern nomenclature**).

Rev. Hort. Paris 1947 : **30** : 435–40.

Descriptions of the cultivated species of *Brassica* classified according to cytological and genetical as well as morphological observations, together with a key for their identification, are presented.

1899. 635–1.524

Laumonnier, R. 633–1.524

Les origines de vos légumes. (**The origin of your vegetables**).

Rev. Hort. Paris 1946 : **30** : 89–92.

Notes are presented on the history of cultivation and origin of some common vegetables.

1900. PLINKA, A. D. 635.25:575.12:578.08
(Methods of artificial crossing of onions).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) **1946** : Nos **11–12** : **25–27.**
Bags are placed on the inflorescences shortly before flowering and when flowering begins the inflorescences of the two forms to be crossed are introduced into the same bag and pollination is effected with a paint-brush, without previous emasculation.It is repeated once or twice at intervals of two days. If it is desired to pollinate with a pollen mixture from several varieties, then all inflorescences in all the bags are pollinated with the same brush. In 1944 by using this method 486 hybrid seeds were obtained from 349 inflorescences.

1901. HATFIELD, W. C. and 635.25–2.421.2–1.521.6(73)
OWEN, J. H. 635.25–2.48–1.521.6(73)
Resistance in onion to smudge, neck rot, and black mold.
Phytopathology **1948** : **38** : p. **12.** (Abst.).
The incidence of smudge (*Colletotrichum circinans*), neck rot (*Botrytis Allii*) and black mould (*Aspergillus niger*) was studied in relation to the plant characteristics of 22 onion varieties. Little correlation was found between the fungicidal and fungistatic action of the expressed juice and its vapour on the one hand and the incidence of smudge on the other. A definite correlation between certain scale characters and the incidence of smudge was shown in coloured varieties; varieties with poor adherence of the outer scales were more susceptible than those with tight well developed scales. This relationship does not exist in the white varieties, in which absence of colour is associated with susceptibility to smudge. The incidence of neck rot was definitely associated with pungency, highly pungent varieties having a higher degree of resistance than less pungent onions. The incidence of black mould was associated with buff colour, coloured varieties being more susceptible than white ones. The parasitic action of the three organisms varied according to their tolerance to the antibiotic substances present in the expressed juice of the succulent scales; *B. Allii* was the most aggressive and the least affected by the antibiotic substances, *A. niger* was the least aggressive and the most affected by the antibiotic substances, and *C. circinans* occupied an intermediate position.

1902. GORENZ, A. M. and
LARSON, R. H. 635.25–2.482–1.521.6(73)
Reaction of onion varieties to isolates of the pink-root organism.
Phytopathology **1948** : **38** : **9–10.** (Abst.).
Onion varieties were tested for their reaction to isolates of *Phoma terrestris* from Louisiana and eight other states. Yellow Bermuda, Beltsville Bunching and one lot of White Sweet Spanish were the most resistant, Crystal Grano, Ailsa Craig and Autumn Queen the most susceptible. In their reaction to a given isolate the varieties always assumed the same relation to one another in order of resistance and susceptibility, although some isolates were highly virulent and others were only mildly virulent.

1903. OWNBEY, M. and
AASE, H. C. 635.26:576.12
Geographical replacement, isolation, and speciation in the *Allium Sanbornii* alliance.
Amer. J. Bot. **1947** : **34** : p. **607.** (Abst.).
Intergradation and divergent development within the *A. Sanbornii* alliance are discussed.

1904. PEIRIS, H. A. and
CHANDRARATNA, M. F. 635.26.00.14(54.8)
Cultural studies with garlic (*Allium sativum* L.). 1. Variety, spacing and manurial trials at Palugama and Boralanda.
Trop. Agriculturist **1946** : **102** : 202–05.
A report is given of yield trials, including spacing and manurial experiments at Palugama and Boralanda, Ceylon, on the Indian varieties of garlic, Mallaipoodu-1944 and Mallaipoodu-1945, and a local variety.

1905. WALKER, J. C. and
LARSON, R. H. 635.34–2.412.5–1.521.6:575.12(77.5)
Development of clubroot resistance in cabbage.
Phytopathology 1948 : **38** : p. 28. (Abst.).
Selfed progenies of kale-cabbage hybrids found in a cabbage field in Wisconsin contained individuals highly resistant to club root. A number of the progenies which had been inbred for four generations showed a uniformly high degree of resistance and the leafy headless character of kale. The F_2 generation of crosses between these inbreds and cabbage contained a small percentage of highly resistant plants of the kale, heading or intermediate types. Selections have been secured from the heading type in which club root resistance is combined with the desired head and plant form.

1906. CHODAT, F. and 635.36:575
GAGNEBIN, F. 635.36:575.11
Amélioration du chou de Bruxelles. (**Improvement of the Brussels sprout**).
Arch. Klaus- Stift. VererbForsch. 1947 : **22** : 360–66.
Methods, aims and results of breeding Brussels sprouts are discussed. An explanation is given of the inheritance of two characters, viz. presence or absence of sprouts on the basal part of the stem, and well-formed sprouts. Each of these characters is determined by a pair of allelomorphs, presence of sprouts on the base of the stem and wild type sprouts being dominant and represented by the symbols *V* and *S* respectively.

1907. BEATTIE, J. H. and
BEATTIE, W. R. 635.41(73)
Production of spinach.
Leafl. U.S. Dep. Agric. 1948 : No. 128 : Pp. 8.
Notes are included on the following varieties: Dark Green Bloomsdale, Long Standing Bloomsdale, Virginia Savoy, Old Dominion, Nobel, King of Denmark, Viroflay, Hollandia and Dark Green Prickly-Seeded.

1908. GAGNEBIN, F. and 635.52:581.143.26.035.1
CHODAT, F. 635.52:581.143.26
L'amélioration de la laitue pommée du Cazard. (**The improvement of the Cazard cabbage lettuce**).
Rev. Hort. Suisse 1948 : 32, 58.
The formation of a head as opposed to rosette formation and bolting is determined by the nature of the soil, photoperiodism and inherited tendencies to develop in a particular way. The inheritance of photoperiodic response and the tendency to form a head is explained.

1909. CUTLER, H. C. 635.61/3:582:575.127.2
Species relations in *Cucurbita*.
Amer. J. Bot. 1947 : **34** : p. 606. (Abst.).
The *Cucurbita* species are divided into two groups. Observations on Mexican and Central American specimens suggest that *C. Pepo* and *C. moschata* may have hybridized where cultivated together.

1910. CHIU, W. F. 635.61/2–2.421.9–1.521.6(73)
The pathogenicity of *Mycosphaeralla citrullina*.
Phytopathology 1948 : **38** : p. 5. (Abst.).
Notes are given on the reaction of melon and squash varieties to *M. citrullina*.

1911. GOLDHAUSEN, M. [GOLJDGAUZEN, M.] 635.61:575"793"(47)
(**Breeding high quality early melons by hybridization methods**).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1945 : No. 11–12 : 25–28.
All the early melon varieties were found to be inferior in quality and a number of them were crossed with Guljabi, a large melon with sweet juicy fruits weighing 5–6 kg., with a very good keeping capacity. The F_1 hybrids were mostly intermediate and segregation occurred in the F_2 for ripening time, transgression for earliness being observed in some crosses. The proportion of early forms varied in the different crosses. Most hybrids were intermediate

in quality, but certain F_2 seedlings combining earliness with high quality and yield appeared, if large populations of 1000–2000 plants were grown. Further segregation occurred in the F_3 and later generations, where new combinations of probable practical interest occasionally emerged.

One promising hybrid, named Guljsor, from the cross Guljabi x Sorokodnevka [Forty-day] was released in 1942 and in Uzbekestan has ripened before the local early melon Handoljak, which it excels in both yield and quality. It has also had great success in north Kirgizia, south Kazahstan and other arid regions. Another promising early melon, Triglj, has been produced by back-crossing to the early parent.

1912. Lutokhin, S. N. [Lutohin, S. N.] 635.61–1.557:581.48:575–181
(The effect of seed size upon the yield of water-melons, melons and squashes).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) 1947 : No. 3 : 19–21.

Genetically identical seeds were sorted into large, medium and small, and the yield of fruit was compared with that from unselected commercial seed. The yield from the large seeded fraction was 77% more than the control in water-melon, 127% more in melon and 47% more in the gourd.

1913. Hope, R. 635.61.00.14(94.5)
Rock-melon variety trials in the Mildura district.
J. Dep. Agric. Vict. 1947 : **45** : 557–60.

Trials of 51 melon varieties and strains at Red Cliffs, Victoria, are reported. The trials have demonstrated the superiority of Hale's Best types, including Mildew Resistant, Purdee 44, V.1 Sulphur Resistant, Perfecto Improved and Powdery Mildew Resistant 45.

1914. Curtis, L. C. and
Scarchuk, J. 635.62:581.162.51:575.11
A bisex sterile variant in *Cucurbita Pepo*.
J. Hered. 1948 : **39** : p. 32.

A male and female sterile line in *C. Pepo* is reported. In plants of this line the male flowers open and are apparently normal, except for the absence of anthers, while the female flowers are also apparently normal but fail to develop mature fruit, and begin to rot within a week regardless of whether they have been sib or cross pollinated. Data have been obtained suggesting that this bisexual sterility depends upon a single factor difference.

1915. Koleff, N. [Kolev, N.] 635.63:576.356.5:581.04(49.7)
[Production of tetraploid cucumber (*Cucumis sativus* L.) plants by colchicine treatment].
Annu. Univ. Sofia Fac. Agron. Sylvicult. Livre 1. Agron. 1941–1942 : **20** : 325–41.

Cucumber seeds of the varieties Nežinski and Datski [Danish] were treated with colchicine solutions for 4 to 10 days. A large number of seeds germinated on the third day. Study of the pollen confirmed the polyploid character of the resulting plants. The varieties reacted differently to variations in strength of the colchicine solution and in length of treatment. Seeds of Nežinski and Datski gave 8% and 2·7% of polyploid plants, respectively.

New morphological characteristics were exhibited, namely greater indentation of the leaves, and fruits of different shapes and colours.

The progeny of these polyploid plants are to be studied. E. W.

1916. Barnes, W. C. 635.63–2.411.4–1.521.6:575(75.7)
Palmetto: mildew battler.
Sth. Seedsman 1948 : **11** : No. 2 : 13, 56, 60.

The Palmetto cucumber has been developed from a cross between Puerto Rico 40 and Cubit at the Truck Crops Experiment Station, South Carolina, and commercially released.

Palmetto is resistant to downy mildew, and it has satisfactory colour, shape and other qualities. The variety is recommended as an autumn crop for the southern states.

1917. Lesley, J. W. 635.64:575
Plant breeding methods and current problems in developing improved varieties of tomatoes.
Econ. Bot. 1948 : **2** : 100–10.

Tomato breeding methods are analysed, including single plant selection, interspecific hybridization, tetraploidy, and the use of heterosis in F_1 hybrids. A useful bibliography of 19 references is appended.

Attention is drawn to the polygenic inheritance of many characters in the tomato, such as fruit size, fruit shape, number of loculi and time of fruit maturity, and the problems thereby entailed in selection. It is suggested that too rigid a selection in the F_2 generation may eliminate important polygenes, on account of their combination with undesirable characters. It may be advisable to postpone selection and raise a large number of small F_3 families, and in selecting not necessarily to favour the more homogeneous F_3 families. In addition, crossing selected plants in different families may be valuable, if it is suspected that too much fixation of genes has occurred in the F_3 or subsequent generations.

The tendency of using a single pure line in single plant selection in the tomato is criticized. The development of a new variety consisting of a mixture of superior pure lines isolated by means of progeny tests is advocated instead.

A discussion is given of the problems of interspecific and intervarietal hybridization involving *Lycopersicon pimpinellifolium* and *L. esculentum* of the subgenus *Eulycopersicon*, followed by back-crossing or selfing, or both. The possibility that too rigid a selection in the F_2 or first back-cross generation may cause the elimination of desirable polygenes is examined.

Hybridization between *L. esculentum* and species of the subgenus *Eriopersicon* is discussed, emphasis being laid on the problem of male sterility in the F_1 hybrids.

The author has obtained a *Verticillium* wilt resistant family with promising commercial characters by selfing a plant from the fourth back-cross generation of the F_1 hybrid *L. esculentum* x *L. peruvianum* var. *dentatum* back-crossed with *L. esculentum*; back-crossing and selfing of the hybrids *L. esculentum* x *L. peruvianum* var. *dentatum* and *L. esculentum* x *L. hirsutum* have in addition resulted in tobacco mosaic resistant plants.

The need for further knowledge of the genetics of disease resistance in the utilization of hybrid vigour is stressed. The possible use of male sterility in the production of F_1 hybrids is discussed, including the production of multiple hybrids.

The economic value of tetraploid tomatoes is still uncertain. Autotetraploids are usually less fruitful than the corresponding diploids, but it is possible that improved fruitfulness may eventually be secured through heterosis in intervarietal hybrids or by selection.

1918. Kohler, G. W. et al. 635.64:577.16:575.12
Selection and breeding for high β-carotene content (provitamin A) in tomato.
Bot. Gaz. 1947 : **109** : 219–25.

Lycopersicon hybrids with a high β-carotene concentration were crossed with commercial varieties and the progeny back-crossed to the commercial varieties. Selections with fruit size equal to that of many commercial varieties and with 83 γ/grm. of β-carotene, and further selections with fruit size equal to that of Rutgers and about 12 times its β-carotene content have been obtained. The frequency with which lines with high β-carotene content were obtained suggests that the number of major factors necessary to obtain high β-carotene content, in addition to those present in commercial varieties, is small.

1919. Young, P. A. 635.64:581.143.32:575
Hereditary defects in tomatoes.
Phytopathology 1948 : **38** : p. 29. (Abst.).

Inherited defects in tomatoes resembling the symptoms of viruses and other diseases are noted.

1920. Li, L. Y. and
Toh, J. S. 635.64:581.163(51)
(Mechanically induced parthenocarpy of tomatoes).
Fukien Agric. J. 1947 : **8** : 25–29.
Three lots each of ten flowers were chosen in an experimental plot of tomato plants. The first lot was covered with paper bags, the second was pressed with the finger tips at the bases of the ovaries, and the third was left undisturbed. Three flowers of the second lot developed seedless fruits. Ordinarily no fruit set could be obtained in the summer season even after pollination. H. C. Y.

1921. 635.64–2–1.521.6:575(73)
Tomato breeders build resistance to diseases.
Canner 1948 : **106** : No. 11 : p. 48.
It is stated that tomato breeders in the United States now have at their disposal sources of resistance to 16 important diseases and are making progress in incorporating some of the factors for resistance into commercial varieties. Moderate to high degrees of resistance to the following diseases are already available or will soon be available in commercial types: *Fusarium* wilt, late blight, early blight, collar rot, leaf mould, *Septoria* leaf spot and grey leaf spot. Two new wilt resistant, mid-season varieties are to be named and distributed soon as a result of progress made in the Southern Tomato Exchange Programme set up by the U.S. Department of Agriculture and State Experiment Stations in the South, Hawaii and Puerto Rico to co-ordinate breeding and testing.

1922. Denman, T. E. 635.64–2.112–1.521.6:575(76.4)
Season-stretching tomato.
Sth. Seedsman 1948 : **11** : No. 3 : 24, 28.
The tomato variety Summer Prolific has been recently introduced by the Texas Agricultural Experiment Substation, Stephenville. Unlike the majority of varieties cultivated under hot dry conditions in Texas, Summer Prolific ripens large fruits in late summer. It was developed from the cross Porter's Scarlet Globe x Stokesdale.

1923. Selman, I. W. 635.64–2.411.4–1.521.6(42.58)
Tomato blights in England.
Plant Dis. Reporter 1947 : **31** : 197–98. (Mimeographed).
The only forcing variety of tomato so far recorded at the Cheshunt Research Station as resistant to late blight is Vetomold.

1924. Bailey, D. L. 635.64–2.484:576.16:631.521.6(71.3)
Physiological specialization in *Cladosporium fulvum*.
Phytopathology 1948 : **38** : p. 2. (Abst.).
The reaction of the following differential tomato varieties and species to *C. fulvum* has been used to characterize the eight physiological races of the disease so far reported in Ontario, Canada: Red Currant (*Lycopersicon pimpinellifolium*), Vetomold, V-121, Stirling Castle, V-473, *L. hirsutum* and *L. hirsutum* var. *glabratum*. Evidence has been obtained suggesting that the development of virulence in *C. fulvum* has been a function of the increasing resistance of the host varieties to which it has been exposed.

1925. 635.64–2.484–1.521.6:575.11
Langford, A. N. 635.64–2.484–1.521.6:575.127.2
Autogenous necrosis in interspecific tomato hybrids and its relation to the breeding of tomatoes for resistance to *Cladosporium fulvum*.
Phytopathology 1948 : **38** : p. 16. (Abst.).
Hybrids derived from crosses between *Lycopersicon pimpinellifolium* and *L. esculentum*, which resemble the cultivated tomato and are immune to *C. fulvum*, normally develop a severe autogenous necrosis, chiefly in the form of leaf spotting, unless the hybrids carry the dominant factor *ne* conditioning freedom from necrosis in addition to the dominant factor Cf_{pl} for immunity to *C. fulvum*, both of which genes are derived from *L. pimpinellifolium*. Susceptible plants show no necrosis, regardless of their genotype *ne*/*ne*. Necrosis is due to interaction between gene Cf_{pl} located on chromosome 4, *ne* located on chromosome 1,

and probably other genes derived from *L. esculentum*. Evidence has been obtained that one or more genes on chromosome 7 may, in progenies resulting from selfing, prevent the development of necrosis in immune plants of the genotype *ne/ne*. Although the discovery of races of *C. fulvum* to which such varieties as Vetomold with the genotype Cf_{pl}/Cf_{pl} *Ne/Ne* are completely susceptible, has complicated breeding work, the widespread distribution of races 1 and 2 suggests that incorporation of the factor Cf_{pl} conferring resistance to these two races is still desirable.

1926. CRANDALL, B. S. 635.64–2.484–1.521.6:575.42(85)
Cladosporium leaf mold of tomatoes in the Peruvian montana.
Plant Dis. Reporter 1947 : **31** : 358–65. (Mimeographed).

An account is given of tests of tomato varieties for their reaction to *Cladosporium fulvum* at the Tingo Maria Station, Peru (cf. Abst. 1177). Resistant types introduced from the United States and Canada have not shown complete resistance, suggesting that either the resistance of these types is unstable or new strains of *Cladosporium* have been encountered. Certain individuals of the commercial varieties previously tested and found to be very susceptible have however survived; resistant selections of Marglobe, John Baer and Rutgers Wilt-Resistant have been secured. Selected progeny of the following have so far proved highly resistant: Improved Bay State, Mold Resistant Waltham Forcing, Globelle, Vetomold, Vetomold 121, Improved Vetomold 121, a Globelle type from Louisiana (L.S.U. 6–1–1) and selection 31–0149–F5 from Turrialba, Costa Rica. Final trials are to be carried out; in the meantime resistant selections are being distributed for trial in other regions of Peru. Possibly Peru, the country of origin of the tomato, is also the country in which *C. fulvum* originated. The value of making selections for resistance in this region is emphasized.

1927. BOWERS, J. I. and PRESLEY, J. T. 635.64–2.485–1.521.6:575(76.2)
Resistance shown by tomato lines to stem blight.
Mississippi Fm Res. 1947 : **9** : p. 8.

A brief report is given of tests carried out at the Mississippi Agricultural Experiment Station in 1945 to determine the resistance of tomato varieties and lines, including lines from crosses between *Lycopersicon esculentum* and *L. pimpinellifolium*, to southern stem blight (*Sclerotium Rolfsii*).

1928. HOLMES, F. O. 635.64–2.8:576.16:631.521.6(73+96.9)
A new type of resistance to spotted wilt.
Phytopathology 1948 : **38** : p. 13. (Abst.).

A spotted wilt virus strain occurring in New Jersey was found to be capable of infecting the tomato variety Pearl Harbor, which is resistant to spotted wilt in the Hawaiian Islands. Resistance to the new strain under greenhouse and field conditions has been secured in a tomato from Argentina, and in hybrids with the susceptible Rutgers variety this character shows monofactorial inheritance. The new type of resistance and the original resistance of Pearl Harbor will facilitate control of the disease and provide information on the geographical distribution of different strains of the virus.

1929. NORRIS, D. O. 635.64–2.8:576.16:631.521.6:575(94)
The strain complex and symptom variability of tomato spotted wilt virus.
Bull. Coun. Sci. Industr. Res. Aust. 1946 : No. 202 : Pp. 51.

Experiments have shown that the spotted wilt virus consists of at least five distinct strains varying in severity of symptoms on the tomato from lethal effect to mild mottle. The tip blight (T.B.) strain in the pure form is characterized by lethal action. The necrotic (N) and ringspot (R) strains produce severe stunting but necrosis of only secondary importance. The mild (M) and very mild (V.M.) strains are characterized by mild mottle symptoms with little retardation of growth and rapid recovery. The methods employed to separate these strains are described, and details are given of the symptoms of the different strains on 16 host plants. It is suggested that the great variability of spotted wilt symptoms on various hosts is largely due to variation in the proportion of the strains present in the inoculum.

Discrepancies in the published descriptions of symptoms caused by the spotted wilt virus in different parts of the world are attributed to the elimination of strains from the virus complex or to the enhancement of expression of certain strains by different host species. It is suggested that the appearance of the disease on the tomato in Australia in 1915 was due to the encouragement of the more severe strains in the course of association with the tomato; possible ways in which the virus was introduced to the tomato in Australia are discussed. The use of a number of "spot" tests on suitable hosts is recommended as a method of detecting spotted wilt strains.
Breeding for resistance in the tomato to spotted wilt is discussed. The resistance shown by *Lycopersicon peruvianum* appears to be a true physiological resistance, in contrast to the resistance of *L. pimpinellifolium*, which depends partly on delay of systemic invasion rather than actual prevention of entry of the virus. Attempts in Australia to breed for spotted wilt resistance have been largely confined to using the field resistance of *L. pimpinellifolium*. But successful results have not been obtained because the character of field resistance is strongly linked with the *L. pimpinellifolium* characteristics of small fruit and other undesirable features. *L. peruvianum* appears to be a more promising source of resistance, and possibly the problem of its incompatibility with *L. esculentum* can be overcome by the technique of embryo culture (*Plant Breeding Abstracts*, Vol. XV, Abst. 397). It is also suggested that the demonstration of the strain complex of spotted wilt can lead to other methods of developing resistance; for example, it should be possible to obtain a hybrid possessing a high degree of tolerance by virtue of a capacity to increase the mildew components of the complex or to exclude the severe strains by hypersensitivity. The use in all countries of a standardized virus from tomato plants is advocated in future investigations on spotted wilt.
An appendix discusses the value of thrips feeding preference tests in tomato breeding for spotted wilt resistance.

1930. 635.65(73)
635.25(73)

All-America selections include seven vegetables.
Canner 1948 : **106** : 12–13.

The snap bean varieties Puregold, Ranger, Supergreen and Cherokee, the pea varieties Victory Freezer and Freezonian, the Lima bean variety Peerless and the onion variety Excel are briefly described (cf. *Plant Breeding Abstracts*, Vol. XVII, Absts 1790 and 1791 and Vol. XVIII, Abst. 1283).

1931. 635.65:575.3(48.5)
Åkerberg, E. and 633.35:575.3(48.5)
Bingefors, S. 633.351:575.3(48.5)
Växtförädlingsproblem för trindsädesodlingens rationalisering i södra och mellersta Sverige. (**Plant breeding problems connected with the growing of peas, vetches and beans in south and central Sweden on a planned basis**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 230–59.

The economic problem of increasing protein production in Sweden has directed attention to many problems concerning the cultivation and breeding of peas, beans, vetches, etc., with improved and reliable yielding capacity, disease and pest resistance, small seed size (in field beans) and adaptation to a particular region, e.g. southern and central Sweden, with which the present paper is concerned.
The aims in selection and breeding of legumes at Ultuna by the Legume Division of the Swedish Seed Association are reviewed with particular reference to peas and their quality. Among the culinary types described as successful are: Brio, previously called Sv 01080, (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1452) and 03023 (cf. Abst. 617).
In contrast to work on cereals, good results are still being obtained by selection among land varieties, as the production of varieties such as 03023, Hero and U05181 show. The selection 03023 is relatively early and not as sensitive to environmental factors as so many Swedish peas are. Nevertheless the most important method of obtaining improved forms

is hybridization. Another culinary variety 03102, obtained by crossing Torsdags II and the fodder pea 0351, seems to give a higher yield in some localities than 03023.
The experimental material at Ultuna includes large numbers of lines from combinations between fodder peas, fodder and culinary peas, culinary and garden peas. The comparative trials comprise (1) fodder peas of various kinds obtained by crossing with V. Pesola's valuable Finnish pea Artturi; (2) culinary peas derived from combinations between medium late and late varieties and between Swedish commercial types and the Viktoria pea
Two out of the five hybrid varieties, U43/49 and U 43/55, obtained from Hero x Artturi have been remarkably high yielding, averaging 109 and 107 respectively as their relative yield if Hero is taken as 100. These Hero x Artturi hybrids are of interest in many other respects, e.g. the low 1000 seed weight and erect stem found in U 43/49. Lines from the crosses Gröp x Artturi and Viktoria x Gyllen have also excelled their parent varieties in yield. Promising material has also been found in hybrids from Gyllen x Viktoria.
The station has also conducted numerous experiments on seed mixtures, including mixtures of peas intended for grazing or green fodder, for which purposes small seeded types are needed that are not so late as the Peluschke type fodder peas which are too late for Swedish conditions.
Special problems in breeding for quality and cookability in particular are discussed, in the light of the findings of Torssell and of Mattson in this field of research.
Vetch breeding is also proceeding at Ultuna where a collection of old Swedish land varieties and foreign varieties has been made. Though it appears difficult to evolve lines superior to the old land varieties in general agricultural value and adaptation to the climate and soil, some lines that seem to show a marked advance have been found, e.g. U 02261, which is of Polish origin and averaged 2175 kg. of seed per ha. during a seven-year trial in which two other improved commercial varieties, one sweet and one grey yielded 1870 and 1945 kg. per ha. respectively; this superiority was maintained in other localities especially at the Östgöta Branch Station, where U 02261 averaged 8% in seven years' comparative tests with the best yielding variety, Östgöta Småvicker [Östgöta Small Vetch].
The improvement of field beans and brown beans is also part of the Ultuna Station programme. The line U 39/19 is cited as a successful field bean selection from small seeded commercial seed. Compared with a land variety sold by the General Swedish Seed Co., [Allmänna Svenska Utsädesaktiebolaget] it yielded 3335 kg. per ha., i.e. nearly 17% more than the commercial seed.

1932. LAMMERS, R. P. 635.65:581.6(49.2)
Kwaliteitsvraagstukken bij consumptiepeulvruchten. (**Problems of quality of pulses for human consumption**).
Landbouwk. Tijdschr. Wageningen 1948 : **60** : 34–40.

Consumption per head is low in Holland. The various factors determining quality are considered, viz., quality of the raw article (e.g. colour, shape, size), cooking properties, and feeding value. The quality of pulses in Holland is discussed and the question of improvement considered. Often, as a result of breeding, yield has been increased at the expense of quality. The phosphate content has an important effect on the tendency to cook soft, which results fron swelling and "solution" of the pectin in the middle lamella of the cell wall.

1933. 635.652:575(45)
TONINI, G. 635.657:575(45)
Nuove varietà di ortaggi. Il fagiolo "Canellino T. 14" Il cece "Bianco a Semi Sferici T. 23." (**New vegetable varieties. The French bean Canellino T. 14 and the gram Round-seeded White T. 23**).
Riv. Frutticoltura 1947 : **9** : 95–96.

Line selection was started with the Canellino bean at Faenza in 1939 and the line T. 14 proved the most promising; it is more uniform and slightly earlier than the original but in all other characters is identical.
The round-seeded form of *Cicer arietinum* is also more uniform than the common type but identical in all other characters.

1934. Anderson, M. E. 635.652:575(77.3)
"Supergreen" makes 1948 lists.
Sth. Seedsman 1948 : **11** : No. 2 : 38, 47.
The Supergreen bush bean variety is described (cf. Abst. 1283).

1935. Boyenval, J. 635.652:581.48
Recherches sur les téguments des grains de haricots. (**Investigations on the testas of kidney bean seeds**).
Rev. Hort. Paris 1947 : **30** : 248–50.
The weights of the testas expressed as percentages of the weights of the dry seeds are recorded for 127 varieties of kidney beans. It is shown that within a variety the percentage is fairly constant but the differences between varieties are well marked.

1936. Smith, F. L. 635:652:581.48:575.11.061.6
Inheritance of seedcoat color in derivatives of Pinto beans.
J. Amer. Soc. Agron. 1947 : **39** : 1039–52.
Most of the variations in the colour of the seedcoat in the Pinto variety of beans are explicable on the basis of the interaction of three genes, *M*, *Rk* and *Br*. These genes occur in the dominant form in normal Pinto beans which have a brown mottling over a buff background. The gene *M* determines mottling, and it has two alleles, *Mst* for striped mottling, and *m* for uniformly coloured beans. The gene *Rk*, in the absence of *M*, produces uniformly coloured buff beans, and in the presence of *M*, a buff background. The recessive allele *rk* produces a pink background. The gene *Br* modifies the colour of the mottling. In the presence of *M*, *Br* produces brown mottling, and *br* green or pink mottling; in the presence of *m*, the gene *Br* is without effect. Beans of the constitution *MRkBr* are thus brown/buff, *MRkbr*, green/buff, *MrkBr* brown/pink, and *Mrkbr* pink. Some linkage exists between the genes *Rk* and *Br*. The seed coat colour types derived from the Pinto bean are genotypically similar to those of other commercial varieties grown in the western United States for the production of dry beans. At least four commercial varieties could have arisen by a few mutations from the Pinto prototype, which has the genetic constitution *PMRkbr*, *P* being the factor for primary pigmentation. The following genotypes are suggested: Striped Pinto, *PMst BkBr*; Pinl, *PmrkBr* or *Pmrkbr*; Bayo, *PMRkbr*; Red Kidney, *PmrkBr* or *Pmrkbr*; and Great Northern, *pMRkBr*.

1937. Townsend, G. R. 635.652–2–1.521.6:575(75.9)
The development of new bean varieties for Florida.
Proc. Fla Hort. Soc. 1946 (1947) : **59** : 92–93.
The work of developing the bean varieties Florida Belle and Florida White Wax at the Everglades Station, Florida, is described (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst, 996). The new variety Dixie Belle has also been developed, and released in 1946. It has been produced from a natural cross between Florida Belle and a rust and mildew resistant hybrid selection; the latter was obtained from a cross between line 6651, a bean of the type Kentucky Wonder, and Bountiful. Dixie Belle is a round-podded stringless bean, resistant to rust, mildew, mosaic and root rot; it is highly productive.

1938. Foster, H. H. 635.652–2.452–1.521.6(76.2)
Reaction to rust, under Mississippi conditions, of certain lines and varieties of pole snap beans.
Plant Dis. Reporter 1947 : **31** : 378–83. (Mimeographed).
Tests of 42 varieties and lines of pole snap beans for their reaction to *Uromyces appendiculatus* (*U. Phaseoli* var. *typica*), carried out at the Mississippi Crops Branch Experiment Station, are reported.

1939. Rupert, J.,
Ortega, B. and
Cardona, C. 635.652–2.485–1.521.6:575.42(72)
Root-rot of the Mexican "frijol".
Phytopathology 1948 : 38 : 22–23. (Abst.).
Root rot of the bean (*Phaseolus vulgaris*) in Mexico appears to be mainly due to *Sclerotium Rolfsii* and *Rhizoctonia Solani*; *Fusarium* spp. may be involved. Bean varieties grown in

Mexico vary considerably in their reaction to root rot. In general the Mexican bean is susceptible. Selection is being carried out in an attempt to secure resistant lines.

1940. Zaumeyer, W. J. and
Thomas, H. R. 635.652–2.8:576.16:631.521.6
Shiny pod (greasy pod) virus and its identity with black root virus.
Phytopathology 1948 : **38** : p. 29. (Abst.).

The virus previously described as the greasy pod virus and as a strain of common bean mosaic is now called shiny virus; and its identity with black root virus has now been established. Varieties such as Idaho Refugee, Logan and Rival, whose resistance to common bean mosaic is inherited from Corbett Refugee, develop typical black root symptoms when inoculated with shiny pod virus. Varieties whose resistance to common bean mosaic is inherited from Great Northern 1, such as Great Northern 15 and 123 and Red Mexican 3 and 34, are resistant. The variety Robust does not develop either black root or shiny pod symptoms. Certain pole beans, such as Kentucky Wonder and Blue Lake, develop black root symptoms when inoculated with shiny pod virus. The black root symptoms develop only on certain varieties resistant to common bean mosaic, and shiny pod symptoms only on varieties susceptible to common bean mosaic.

1941. Grogan, R. G. 635.652–2.8:576.16:631.521.6(77.5)
The relation of common bean mosaic to black root.
Phytopathology 1948 : 38 : 10–11. (Abst.).

Inoculation experiments have shown that in varieties of string bean whose resistance to common bean mosaic (bean virus 1) is derived from Corbett Refugee, black root symptoms are an expression of common bean mosaic infection in the highly resistant plants. Varieties of beans, in which resistance to common bean mosaic has been derived fron the Robust or Great Northern varieties, showed no necrosis or black root when inoculated. All varieties of bush bean that were tolerant or susceptible to bean virus 1 remain free from black rot.

1942. Grogan, R. G. 635.652–2.8:576.16:631.521.6(77.5)
A pod-distorting strain of the yellow-bean mosaic virus.
Phytopathology 1948 : **38** : p. 10. (Abst.).

The occurrence in Wisconsin of a strain of yellow bean mosaic (bean virus 2) on varieties of the Refugee type is reported; it causes severer stunting than the common strain of virus 2 and distorted pods. Its host range is much narrower than that of the common strain. The common strain infected all the varieties tested. The virus from the pod-distorted plants did not infect Great Northern UI 59, UI 123 or UI 81, and in Great Northern UI 1 and UI 15 Michelite, Stringless Blue Lake, Scotia, Tendergreen, Bountiful, Potomac, and McCaslan, it caused top necrosis.

1943. Zaumeyer, W. J. and
Thomas, H. R. 635.652–2.8–1.521.6(75.7)
Pod mottle, a virus disease of beans.
Phytopathology 1948 : **38** : p. 29. (Abst.).

A new virus causing mottling and malformation of the pods was isolated in 1945 from plants of *Phaseolus vulgaris* in South Carolina. Immunological tests showed no relationship between the new virus, termed pod mottle, southern bean mosaic and common bean mosaic. As in the case of southern bean mosaic, a variety susceptible to local lesion is resistant to systemic infection and a variety resistant to local infection is susceptible to systemic infection. All the 64 bean varieties tested were susceptible to either local or systemic infection. Varieties susceptible to local infection can be considered as resistant for commercial purposes.

1944. Magruder, R. and
Wester, R. E. 635.653:575(73)
A "Triumph" in bush Limas.
Sth. Seedsman 1948 : **11** : No. **3** : p. **13.**

The Lima bean variety U.S. 343 has been named Triumph. It was developed from a cross between Fordhook and Sieva. Extensive yield trials in the United States and Canada have shown that Triumph is not as consistently high yielding as Henderson; under

favourable conditions, however, it has outyielded Henderson at a number of locations. At Beltsville, Maryland, the variety reaches a stage of maturity suitable for processing in 72–82 days. In the quality of its processed beans Triumph is considered to be superior to Henderson, it is recommended for the domestic garden and for commercial freezing and canning.

1945. FARISH, L. R. 635.654:575.42(76.2)
Mississippi strains of cowpeas shown as outstanding in tests by the Delta Station.
Mississippi Fm Res. 1947 : **10** : No. 3 : 1, 8.

Trials are reported of cowpea selections developed at the Mississippi Agricultural Experiment Station and the commercial varieties, Bunch Purple Hull, Extra Early Blackeye, Brown Crowder, Whippoorwill and California Blackeye. All the selected strains gave higher yields than the commercial varieties; they also produced larger and more attractive pods and seeds than most of the latter. The edible qualities of the selections, however, are not considered to be as good as those of Bunch Purple Hull. It is thought that the early maturing strain Mississippi No. 2 shows particular promise as a cowpea for the fresh market. The pods are green, 8–9 inches in length; the seeds are large, tan coloured, with brown eyes. The strain is prolific, yielding two to three pods on most of the fruiting stems. In the Mississippi Delta the strain is of the semi-bunch habit.

1946. CIFERRI, R. and BALDACCI, E. 635.655(45)
Principali razze di soia coltivate in Italia. (**Principal soya bean races cultivated in Italy**).
Ital. Agric. 1947 : **84** : 335–36.

Comparative tests of a number of soya bean varieties, a key for the determination of which is given, show that the best results are obtained from the varieties bred or selected in Italy, though certain of the foreign varieties appear promising for purposes of hybridization.

1947. ANDERSON, G. and OLSSON, G. 635.655:575(48.5)
Redogörelse för arbetena med soja vid Sveriges Utsädesförening åren 1944–1946. (**Report on the work with soya bean at the Swedish Seed Association during the years 1944–46**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 460–82.

This is a progress report on soya bean breeding in Sweden. The procedure, methods of cultivation and breeding, and the results are given in some detail. Since the investigation began in 1938, 559 different foreign varieties have been tested to determine their suitability for Swedish conditions and for use as parents in hybridization (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 641 and Vol. XV, Abst. 784)

The report on the variety trials contains details of the performance of the 23 best foreign varieties and some selections from them during 1938–46. Green Jap and Yoshioka Chiurii were about a week earlier and yielded about 25% more than the Polish control variety Soja Wilnensis. This preponderance was affected by the type of soil. Both green Jap and Yoshioka are relatively low in fat content and high in protein and are very low growing and therefore unsuitable for machine harvesting, a fact which makes their cultivation impossible.

The yellow seeded Svansjö II, Svansjö III and Soja Puławka ripened a week later than the control, but the first two yielded on the average 10–15% more than Soja Wilnensis. All three have a relatively high oil content, but they have other defects including susceptibility to virus attack.

Black seeded varieties included Black O, Altonagaard AI, AI–10 and BI, Wisconsin Black, Delitscher Schwarze [Delitsch Black] and Dalny Vostok [Far East]. In some experiments they failed to ripen, but the acreage yield of seed from Black O and Altonagaard AI–10 was 100% more than from Soja Wilnensis.

Material received from Riede in Bonn and hybrids from Dotnuva in Lithuania seemed somewhat more suitable for cultivation in Sweden. Of the German material, Soja 2 proved

as early as Soja Wilnensis and had a higher oil content and was satisfactory as regards habit of growth.
In 1945 and 1946 trials of lines selected from new strains raised from hybrids between the best foreign varieties have been conducted on as large a scale as possible. The method of selection among the hybrids had to be modified to save labour and expense, so progress will be slower.-
The line Sv 41/67, a selection from Sv 38/66 previously selected from the German material, proved higher yielding than Sv 38/66 but also later maturing. Dotnuva Hybrid 1052, a line from the Lithuanian cross Dotnuva's Rudagrude x Dotnuva's Geltongrude, surpassed the control in yield, earliness, and fat content of the seeds and also as regards habit, and should be specially useful for breeding purposes. The F_5 from this cross is still segregating. Hybridization with subsequent selection is shown to be the only method of obtaining suitable varieties for Swedish conditions.
The new lines from the Swedish Seed Association's own crosses are superior to the control Soja Wilnensis and their parents and to the representatives of the different types of varieties that have been tested. Most of the new lines averaged over 1000 kg. per ha. and the best 1200–1250 kg. Some lines have exceeded both the control and the superior parent in yield by more than 100%.
Increases in earliness among the new lines are also remarkable, some being 15 days earlier than Soja Wilnensis. Evidence was also obtained showing that genes for earliness may be carried by late varieties, e.g. the varieties Altonagaard AI and Delitscher Schwarze which on being crossed gave a line Ug 45/46, which was from 14 days to three weeks earlier than the parents and three days earlier than Soja Wilnensis. Other similar examples are cited. Many of the new lines are medium tall and thus superior to the earliest ripening commercial varieties which are low growing like Green Jap.
The crude fat content of most of the new lines was considerably higher than that of Soja Wilnensis, but the crude protein content was generally lower.
Mutant characters found after X-ray irradiation include: altered seed colour and type of seed coat, increased anthocyanin in the leaves, higher yield and oil content, and earlier maturation as compared with the parents. Mutants have also been obtained that are taller than the parents and some that set seed apparently better able to tolerate early sowing. In future X-irradiation should be applied to the best new lines from crosses instead of to the older varieties.
The economic value of the soya bean in Swedish agriculture is discussed and the need for still further improvement is pointed out, increased blight resistance and improved quality of seed being included in the breeding programme briefly outlined. The results of seed inoculations with bacteria are also recorded.
English translations are given for use with the tables.

1948. Dimmock, F. 635.635:575(71.3)
Soybean breeding at Ottawa.
Soybean Digest 1948 : **8** : No. 5 : p. 18.

Soya bean breeding work at the Central Experimental Farm, Ottawa, Ontario, is briefly described. The investigations have resulted in the development of the varieties Mandarin (Ottawa), Kabott and Pagoda, and more recently Capital. Capital originated from the cross strain 171 x A.K. (Harrow) made in 1935. Strain 171 was a selection derived from Manchurian material. Capital is taller, earlier and slightly higher in yield than Mandarin (Ottawa).

1949. Humphrey, L. M. 635.655:575(76.7)
R.L. Dortch Seed Farms. 1947 variety test.
Soybean Digest 1948 : **8** : No. 5 : 14–15.

A report is given of tests of 27 experimental soya bean strains and commercial varieties conducted in 1947 at the Station Place Plantation of the Robert L. Dortch Seed Farms, Scott, Arkansas. Data are given on yield, shattering, drought resistance, bean size, lodging and days to maturity. Dortchsoy No. 2 (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1353) and the new strain Dortchsoy No. 31, both selections of Ogden, gave the highest yields. Dortchsoy No. 31 is three weeks later in maturity than Dortchsoy No. 2, thus

extending the season of combine harvesting. Both strains showed resistance to shattering and drought. Dortchsoy No. 31 was also resistant to shattering.

1950. 635.655:575(75.7)

Yelnando soybean.

Soybean Digest 1948 : **8** : No. **3** : p. 9.

A note is given on the soya bean variety Coker's Yelnando, which has been developed by Coker's Pedigreed Seed Co., Hartsville, South Carolina, from a chance cross between Coker's Yelredo (Mammoth Yellow x Laredo) and Nanda. The variety is highly resistant to shattering, and is suitable for combine harvesting. It does not however give such high yields of seed and hay as certain other varieties.

1951. King, B. M. 635.655:575(77.8)

New soybean makes its bow. . . .

Soybean Digest 1948 : **8** : No. **5** : 11–12.

The new soya bean variety Missouri S-100 has been developed at the Missouri Experiment Station. It has given higher yields than Chief, Patoka and other varieties during several years' tests in Missouri. The variety has satisfactory oil content, and is medium late in maturity, ripening about two weeks earlier than the late varieties hitherto used in the cotton and soya bean rotation. The new variety was developed from a natural hybrid found by a farmer in north-west Missouri 15 years ago.

1952. De, S. S. 635.655:581.6(54)

Supplementary effect of different varieties of soya-bean to poor rice diet.

Sci. and Cult. 1947 : **13** : p. 120.

Of three soya bean varieties tested in experiments on rats for their nutritive value as supplements to a rice diet, Ranchi (yellow) gave the best results and Ranchi (black) the next best, while Lyallpur (black) produced a slight retardation in growth as compared with the control. Systematic investigations of the nutritive value of different soya bean varieties are in progress at Bangalore.

1953. Caldwell, J. S.,
Culpepper, C. W.,
Hutchins, M. C.,
Ezell, B. D., and
Wilcox, M. S. 635.655:581.6(73)

Dehydrated green vegetable soybeans.

Soybean Digest 1948 : **8** : No. **5** : 20–21, 24–28, 30.

An account is given of experiments on the suitability of soya bean varieties as vegetables in the form of dehydrated, canned and mature dry bean products. A more detailed report has already been published (cf. Abst. 572).

1954. Ricker, P. L. and
Morse, W. J. 635.655:582:001.4

The correct botanical name for the soybean.

J. Amer. Soc. Agron. 1948 : **43** : 190–91.

The use of various botanical names for the soya bean is reviewed. According to the International Rules of Botanical Nomenclature the correct name is *Glycine Max* (L.) Merrill

1955. Lamm, R. 635.656:575.116.1:576.356.2

Linkage values in an interchange complex in *Pisum*.

Hereditas, Lund 1948 : **34** : 280–88.

The detection and estimation of linkage between the gene pairs *Fs fs*, *St st* and *B b* in *P. sativum* have been made possible by the use of data referring to an F_2 progeny and a back-cross in both of which a reciprocal translocation was involved. The translocation was probably identical in each case and derived from the variety Extra Rapid. The point of interchange proved to be situated to the left of the section *St—B* of the B chromosome. The cross-over values calculated for the genes *B* and *St* were only about 12·8% and 9·3% in the F_2 and back-cross respectively as compared with 26% in the normal type without the translocation. If the centromere of the B chromosome is situated to the

right of the gene *B*, the reduction of crossing-over may, it is suggested, be partly accounted for by the position of the *St–B* segment between the centromere and the point of interchange.

1956. Peat, S.,
Bourne, E. J. and
Nicholls, M. J. 635.656:581.192:576.16
Starches of the wrinkled and the smooth pea.
Nature, Lond. 1948 : **161** : 206–07.

Differences between the starches of *Pisum sativum* and *P. arvense* L. are reported and it is pointed out that the results are of interest in connexion with the suggestion that the former species has been derived from the latter by artificial breeding.

1957. Pierce, W. H. 635.656–2.421.1–1.521.6:575(73)
Resistance to powdery mildew in peas.
Phytopathology 1948 : **38** : p. 21. (Abst.).

Hybrid progenies from crosses between a selection of the garden pea variety Stratagem possessing resistance to *Erysiphe Polygoni* and Shasta have yielded promising selections, which are being increased for introduction. Resistance appears to be a recessive character depending upon a single gene.

1958. Bingefors, S. and
Wiklund, K. 635.656–2.7–1.521.6(48.5)
Ärtvecklaren som skadegörare i ärtförsök vid Sveriges Utsädesförening, Svalöf, och dess filialer under åren 1933–1946. (**The pea moth maggot as a pest in pea trials by the Swedish Seed Association at Svalöf and its branch stations during 1933–46**).
Sverig. Utsädesfören. Tidskr. 1947 : **57** : 280–90.

Extensive material has been collected for the study of the extent of pea moth maggot damage to large numbers of pea varieties at the Svalöf Station and various branch stations of the Swedish Seed Association. One of the main objects of the research was the determination of any varietal differences in the amount of damage caused by the maggot.
The present preliminary account of some of the results gives indications of possible relations between earliness (onset of flowering) and pest damage, but latitude and earliness or lateness of the season are also apparently factors of some importance, and at the Västernorrland Station varieties with small seeds were found to be much more severely damaged than large seeded varieties.
At the Norrland branch station the varieties of *Pisum sativum* seemed to be more easily attacked than those of *P. arvense*.
The difficulties to be overcome in trying to breed resistant varieties are great, but observations on the biology and ecology of the pest should not be abandoned.
A full report is to be published later.

1959. Pesola, V. A. 635.656.00.14(47.1)
Ilo ja Paula. Uusia ruokahernejalosteita. (**Ilo and Paula. New table varieties of pea**).
Valt. Maatalousk. Tiedon. 1942 : No. 184 : Pp. 12.

The culinary pea varieties Ilo and Paula from Jokioinen are compared with Sinikka, Koivisto, Kaleva, Torstai II [Thursday 11] from Svalöf, and the forage pea Artturi. The comparisons are concerned mostly with the yield, duration of the growth period, plant height, cooking qualities and flavour, and the size and colour of the seeds. Both Ilo and Paula gave satisfactory results in the trials in Finland.

1960. Atchison, E. 635.659:576.312.35:575.127.2
Studies in the Leguminosae. I. Chromosome numbers in *Erythrina* L.
Amer. J. Bot. 1947 : **34** : 407–14.

The following chromosome counts are reported: $2n = 42$, in *E. abyssinica, E. Caffra, E. Humeana, E. senegalensis, E. suberosa, E. Vespertilio, E. fusca, E. variegata, E. americana,*

E. Berteroana, E. Buchii, E. Corallodendrum, E. Crista-galli, E. Dominguezii, E. falcata, E. flabelliformis, E. Folkersii, E. glauca, E. Grisebachii, E. guatemalensis, E. herbacea, E. lanceolata, E. macrophylla, E. mexicana, E. pallida, E. rubrinervia, E. speciosa, E. velutina and *E. verna*; and $2n = 84$, in *E. acanthocarpa* and *E. amazonica*. *E. herbacea* includes both herbaceous and arborescent forms. The various species of *Erythrina* appear to be closely related and interspecific hybridization may occur readily.

1961. HASKELL, G. 635.67–2.111–1.521.6:578.08
Effect of low temperature on the germination of inbred lines of sweet corn.
Science 1948 : **107** : p. 150.
A method of selecting cold hardy lines of inbred sweet corn is described.

BOOK REVIEWS

ANDREWS, H. N. (JUN.) 56

Ancient plants and the world they lived in.

Comstock Publishing Co. Inc., Ithaca, New York 1947 : $4.50. Pp. ix + 279 : 166 figs.

Palaeobotany is not a subject appealing immediately and spontaneously to anyone not specializing in it. To fire the imagination of the non-specialist it must be vivified; either the fascination of fossil hunting in the field must be imparted, or alternatively the subject must be written up in a style not too reminiscent of the darker corners of a geological museum.

Dr Andrews has set out to achieve the latter alternative, and has produced a most engaging survey of the principal groups of fossil plants. Ferns, lycopods, the calamites and their allies, pteridosperms, conifers, thallophytes, bryophytes and flowering plants all receive mention, and are described in a breezy and familiar style that makes the whole book a pleasure to read. Diagrams are plentiful and of very high standard.

In addition to the descriptive matter, the author does not disdain a wealth of digression, including, for example, an account of the vicissitudes of a typical fossil collecting expedition. These digressions add much to the attractiveness of the book, and season it with the flavour of the wide open spaces of the west.

Although written with no pretence at gravity, it is clear that the author is fully conscious of the many unresolved problems that palaeobotany presents. In particular, he appears to be haunted by the mystery of the origin and extinction of so many of the great fossil groups; and although he duly sets down the conventional platitudes on this subject, he does not appear to wish us to take these too seriously. The pedant might possibly quarrel with such concepts as racial age, irrepressible urges in plants, or free will in insects, which the author playfully interposes in his text; but there are occasions when philosophic accuracy is out of place, and the present occasion is one.

The least satisfactory part of the book is chapter XIII on the history of palaeobotany, which seems to be largely written up from secondary sources. The author shows little trace here of an understanding or appreciation of the palaeontological interests and controversies of the pre-Darwinian period. The whole chapter is written from a patronizing twentieth-century point of view projected back into an era when conditions were very different. Instead of assessing the achievements of early palaeontologists in the light of the facts at their disposal, he judges them disparagingly in the light of the information that has since come to light.

For the rest,however, on the fossils with which the author is so well acquainted at first hand, the book is excellent and can be recommended as one of the very best introductions to the subject.

575:633(49.2)

Twee en twintigste beschrijvende rassenlijst voor landbouwgewassen met Bijlage. (**22nd descriptive variety list for agricultural plants with supplement**).

Inst. Plantveredeling, Wageningen 1947 : Pp. 241.

Growers and breeders of economic crop plants in English and French speaking countries as well as in Holland will welcome the 1947 edition of this extremely useful manual. In addition to providing up-to-date information on varieties and on regulations affecting Dutch growers and breeders, instructions are given on how to use the list, and explanatory keys in French, English or German to the headings and various other portions of the manual, such as the section on potatoes and potato varieties, are also obtainable.

The section on grasses has been recast this year.

Varieties of crops for export receive separate treatment.

Measures are being taken to raise further the standards in breeding and inspection of fodder crops, which are not yet quite on the same level as cereals, pulses, potatoes, flax, etc. (cf. also *Plant Breeding Abstracts*, Vol. XVI, Abst. 1585).

SCHIERBEEK, A. 576.12
400 jaar *Linaria*-onderzoek. (**400 years of research on *Linaria***).
Uitgeverij het Spectrum, Brussel 1946 : Pp. 45.

The educational series to which this original and stimulating booklet belongs is entitled *Problems of Natural Science and their Historical Development.* The series is intended to arouse the interest of the young student, who may perhaps adopt the study of science as his future occupation, in some particular problem in the field of scientific research and the methods that have been used in the attempt to solve it.

Dr Schierbeek has chosen for this treatment the problems presented by *Linaria vulgaris* from the first mention of *L. spuria* in the Materia Medica of Dioscorides in the year A.D. 1 up to the present day. The problems whose development is traced include: the identification of the plant and the occurrence of peloria, pollination and the supposed function of the corolla markings in insect pollination, the effects of cross-pollination and inbreeding, the demonstration of mutation and the hereditary transmission of mutant forms, and finally recent discoveries about the role of colour in attracting insects to flowers or baits.

The presentation is admirable in its clarity and simplicity while the subject itself provides an interesting example of the way in which the problems of scientific research are interlocked and how the study of an apparently unimportant object may lead to advances of fundamental significance for scientific theory.

As a stimulus to the rising generation of young scientists in Holland, the work could not have been better done.

DANGEARD, P. 576.3
Cytologie végétale et cytologie générale. (**Plant cytology and general cytology**).
Paul Lechevalier, Paris 1947 : 1.250 f. Pp. 611. 246 figs. (Encyclopédie Biologique 26).

The rate at which cytological studies are progressing is such that a treatise dealing with this branch of biology can make no pretence of being the last work on the subject. Many of the different aspects of cytology are dealt with, however, in the work under review, and it is the more interesting for the fact that the author has not only explained modern concepts and hypotheses but has also traced their historical development. He has dealt chiefly but not exclusively with the plant cell, which is treated, not simply as a static object as it appears in fixed and stained preparations under the microscope, but as a living entity undergoing constant change.

No specialized knowledge on the part of the reader is assumed, the book being intended to serve as an introduction to cytology. It begins with a simple and generalized account of cell structure. The first chapter deals with protoplasm, its composition, structure and behaviour, and the second and third chapters with chondriosomes and plastids. About half the book is devoted to the nucleus and especially the chromosomes and their behaviour during nuclear division in both typical and atypical cells. Descriptions are included of the nuclei of the lower organisms. There is a chapter on cytogenetics in which mutations are discussed, and another on the sex chromosomes and problems connected with them. The concluding chapters pertain to the vacuome of cells, the Golgi apparatus, various inclusions of the cytoplasm, and the plant cell wall.

A valuable feature of the book is comprised by the bibliographies at the ends of the chapters. These are quite extensive but they are not, of course, exhaustive; they include English, French and German literature published up to 1946. There is, in addition, a very useful glossary which can be recommended both for its scope and for the simplicity and clarity of its definitions. Indexes are also appended.

LEQUENNE, F. 581
Plantes sauvages. (**Wild plants**).
René Julliard, Sequana, Paris 1944 : Pp. 318.

Plantes sauvages comprises a series of essays by a French naturalist, describing his own experiences in childhood and later life. The narrative is interspersed with remarks about

the wild flowers with which he was familiar and with explanations of their pollination and seed dispersal mechanisms, the medicinal properties attributed to them and so on. It is the sort of book which can be enjoyed by non-scientists and may well arouse in them beginnings of an interest in natural history.

DEGENER, O. 582(96.9)
Plants of Hawaii National Park. Illustrative of plants and customs of the South Seas.
New York Botanical Garden, New York : 1945 : Pp. xv + 314 : 45 figs : 95 illus.

It is natural that the folk lore of any race should be closely bound up with the flora of the country concerned. The ethnologist must therefore make some botanical study, while the interests of the botanist will be stimulated by some knowledge of the associations of the flora with the inhabitants of the region. Of no place will this be more true than the South Sea Islands, whose origin, geographical position and history give them a peculiar interest. To meet the demand created during the war years for some general guide for the visitor to these parts, this volume has been produced as an expansion of an earlier account by the same author of the vegetation of Hawaii.

A brief outline of the geological history of the Hawaiian Archipelago, and of the origin of its flora, which at present consists of about 85% of endemic species, provides an introduction to the book, which consists for the rest of a systematically arranged series of descriptions of pteridophytes and angiosperms found in the Hawaiian National Park. The habitat and habits of each species are given, with a concise morphological description, followed by any points of general, historical, ethnological, or economic interest concerning its presence in the Islands. The systematic position with frequent reference to related plants is noted, together with English, Latin and native names. If these equivalents were in addition given in tabular form the usefulness of the book would be much enhanced. The non-botanical reader is well catered for in these descriptions, where the technical terms employed are also defined, but a glossary of those occurring more frequently or even a brief introduction to the general anatomical features of the plants described would have simplified the book considerably. The abundant photographs are so poorly reproduced as to contribute little to the charm of the book but copious excellent drawings illustrate it throughout, though it is doubtful if these efficiently replace a key to the species as is claimed.

The accounts of native customs are full of interest, but a more complete glossary of native terms than that included in the index would facilitate the perusal of the book by the unfamiliar reader. Despite these faults, however, and a rather naive style throughout, the volume constitutes a valuable aid to the traveller in this part of the world anxious to gain a general knowledge of the local folk lore, and wishing to identify the plants he meets.

R. H. R.

VAN HALL, C. J. J. and
VAN DE KOPPEL, C. 63(92)
De landbouw in den Indischen Archipel. 1 Algemeen Gedeelte.
(Agriculture in the Indian Archipelago. 1 General Section).
Uitgeverij W. van Hoeve, 's-Gravenhage 1946 : f. 17.50. Complete f. 67.50. Pp. 423. Figs. Graphs.

It is some thirty years since the second edition of Van Gorkam's *Oost Indische Cultures* appeared, and during that period an enormous amount of agricultural research has been conducted in the East Indies. Particularly in the plantation industries, practice has been revolutionized and the face of the country completely changed. Still the colourful scenery depicted in the wrapper remains typical of the beauty of these islands. Though the terraced paddy fields bear witness to the permanence of some systems of agriculture, a new work incorporating the changes that have occurred was overdue, and during the German occupation of Holland, a handful of lovers of the Dutch East Indies got together and, despite the invader, produced the manuscript for the first volume. A glimpse of the fantastic difficulties overcome, including the rewriting of one contribution confiscated as 'staatsgefährlich', is given in the foreword.

The book opens with an article on the soil by E. C. J. Mohr, dealing with soil processes, rules for conserving and improving the soil, and the principal soil types of the Dutch East Indies. C. Braak deals with climate, J. Th. Metzelaar with irrigation, G. Leurink with animal husbandry, while J. G. Ossewaarde and S. J. Wellensiek, contributed selected chapters on the cultivation of plants. The remaining chapters, as a result of the tragic course of events during the last years, promise to be of historical importance; they deal with the economics of native agriculture (G. J. Vink), agricultural legislation (G. J. Nolst Trenité), labour conditions (Cecile Rothe), and agricultural statistics (C. van de Koppel). The very names are a guarantee of the quality of the work, which was brought up to date by the co-operation of men repatriated in 1946. In the following volumes articles are to appear on food, medicinal, fibre and miscellaneous crops and spices, e.g. rice, maize, millet, sesame, sago, and fruits, pepper, nutmeg, mace, vanilla, cloves, cinnamon, betel nut, paprika, gambir, tea, coffee, cocoa, tobacco, coca, quinine, tung oil, derris and sandalwood. The lists of crops from which these examples have been selected gives an idea of the agricultural wealth of the Dutch East Indies. In 1927 the values of agricultural exports exceeded £100,000,000; while in Java and Madura alone there are over 30,000,000 acres of land.

The book makes fascinating reading, the following tirade by Mohr: 'Then comes Man! And he fells and he burns and he fells and he burns and he clears the land until it lies spotless. Then are all the natural processes turned upside down. The sun burns the surface with a glowing heat, so that it dries out as never before. The heavy rains, that were formerly caught by the leaf crown, now spatter onto the nice loose crumbs and splash them together; the fine particles wash into the soil and close it tighter than ever it was in the jungle. If the land slopes ever so slightly, erosion starts, and the surface soil containing the humus goes first. New material from which to make humus is no longer available, but the destruction and leaching goes on' describes a condition that was almost universal 30, or even 20, years ago, and led, in part at least, to the disastrous floods of 1926 in Malaya, when the water rose 60 feet in places and men took refuge in trees, and a sampan was used by clients in the banks in Kuala Lumpur.

In the selected chapters Ossewarde deals in a most practical manner with clearing, soil conservation, seed, planting and upkeep; while Wellensiek handles the subjects of plant material and selection and discusses field experiments. The latter subject is of necessity so cursorily discussed that omission might have been preferable.

It is regrettable that the language difficulty will allow so few people in this country to enjoy such an excellent book, which should fill a long felt want, not only for those about to take up employment in the Indies, but also to experienced planters. The following volumes should prove of exceptional value as they deal with an unusual range of crops. C. B.

BAWDEN, F. C. 632(42)

Plant diseases.

Thomas Nelson and Sons Ltd. Edinburgh 1946 : 7s. 6d. Pp. x + 206. 30 plates.

There has been for some time in Britain a crying need for a book on the general problem of plant disease. Young students of plant pathology repeatedly ask for advice on what to read and in recent years it has been increasingly difficult to answer this question. Moreover, many farmers and growers want to know the reasons underlying the measures they are advised to carry out. Mr. F. C. Bawden's *Plant Diseases* should undoubtedly help to meet these demands.

The author says in his preface that the book is not a text-book of plant pathology but an effort "to summarize, for those with some knowledge of biology and interest in growing plants, the general principles of the subject". This aim has been largely fulfilled by a straightforward account and discussion of the plant disease situation in Britain. The book should therefore be of considerable assistance to all who, already knowing something about plant diseases, wish to enlarge their knowledge.

In the nine chapters of the book the following topics are set forth and discussed: the causes of disease in plants; seed-borne diseases; soil-borne diseases; air-borne and insect-borne

diseases; the alternate and alternative host; physiological diseases; the influence of environment on infectious diseases; genetics and plant diseases and the control of plant diseases. The examples illustrating these topics are drawn from the major crop diseases in this country and are accompanied by several excellent photographs.

It is to be regretted that no references have been given, for their inclusion would have rendered the book of greater service to advanced students. Moreover the expert will probably ask for the evidence for such statements as " . . outbreaks of black rust of wheat in eastern England arise from spores which have travelled from the Continent. . ." Since later in the book it is pointed out that ". . . black rust is now common only in south-west Wales where the barberry is abundant . . ", it may be asked is this not the more likely source of infection since the prevailing winds are from that area. Further, one may perhaps be forgiven if one quibbles with the author for having applied the words "not infallible" to the peach aphis.

In discussing the yields of British crops the author says that "many of the losses now experienced are unnecessary because they could be avoided by the application of existing knowledge". *Plant Diseases* is a noteworthy contribution to the dissemination of this knowledge and should be read and enjoyed by all who are interested in the subject. M. A. K.

CHESTER, K. S. 632(73)

Nature and prevention of plant diseases.

The Blakiston Company, Philadelphia 1947 : 2nd Ed. Pp. xi + 525. 224 figs. 9 tables.

Like the first edition published in 1942, the second edition of Professor K. Starr Chester's *Nature and Prevention of Plant Diseases* is designed for use in the United States by students of agriculture who require an elementary training in plant pathology. Consequently the book is of limited use outside that country although many diseases of world-wide occurrence are dealt with. It is natural, however, that the stress is laid upon their development and control in America.

The book deals with diseases caused by fungi, bacteria, viruses, parasitic seed plants and algae, nematodes or eelworms and non-parasitic agents. As in the first edition there are chapters on the general significance of plant diseases, the methods of studying them, the effect of environment upon them and the various means of controlling them. It is these chapters on the general principles of the subject which are most likely to be of use to non-American students.

In the second edition there has been some rearrangement of the diagrams and various new illustrations have been added. Considerable alterations have been made in the chapter on virus diseases, and several diseases, fungal, bacterial and virus, have been treated in greater detail than in edition one. A useful addition is a table giving the names of the principal chemicals used in plant disease control, their common or trade names and their principal or prospective uses. Another addition is a glossary which should be of great assistance to the young student. M. A. K.

632.452

CHESTER, K. S. 633.11–2.452:576.16:631.521.6:575

The nature and prevention of the cereal rusts as exemplified in the leaf rust of wheat.

Chronica Botanica Co. Waltham, Mass.; Wm. Dawson and Sons, Ltd., London. 1946 : $5.00. Pp. xvi + 269. figs. 19 tables.

In these days when the stream of scientific papers is reaching flood proportions the monographic treatment of a topic by an authoritative author is to be welcomed. Professor Chester's book deals almost exclusively with leaf rust of wheat (*Puccinia triticina*) and its short title, *The Cereal Rusts*, is consequently rather misleading. In the 236 pages of texts many facts have been marshalled about the occurrence and damage caused by this fungus, the host-parasite relationship, the physiological specialization and dissemination of the parasite, the factors affecting its survival and development and finally its control. This information has been assembled from many sources, there being nearly 500 references.

A noteworthy feature is the frequent reference to Russian work, the author stating in his foreword that these papers have been fully translated and that copies may be had on loan. The book is, however, more than a mere compendium; it is also a critical assessment of our present knowledge about *P. triticina*. It serves, therefore, the twofold function of gathering together the available information and of revealing where further research is necessary.

Few students of biology can fail to be fascinated by the rust fungi; their morphological metamorphoses and intricate host relationships provide endless material for the speculative mind. Amongst cereal rusts *P. graminis* is often believed to be the most damaging, and readers may be surprised to learn from Professor Chester that *P. triticina* (leaf rust of wheat) causes greater reduction of world wheat supplies than does *P. graminis*.

P. triticina, world wide in distribution, lives for the most part without an alternate host, only in Siberia alternating between the highly evolved monocotyledon, wheat, and the more primitive dicotyledon basilisk, *Isopyrum* (*Leptopyrum*) *fumarioides* (Ranunculaceae). In many places the fungus survives from one wheat crop to the next as mycelium on volunteer plants and in others is reintroduced yearly as wind-borne uredospores. These features are of primary importance when methods for controlling the fungus are under consideration.

Probably many will not agree with Professor Chester's "concept of environmentally conditioned *race groups*, recognizing as single races those groups of races the reactions of which duplicate those of others of the same group under certain environmental conditions" (p. 84). His discussion, however, of physiological specialization and practical suggestions regarding methods of identification of races will interest all concerned with this phenomenon even if they are unable to subscribe to his views.

Professor Chester criticizes discursively the various theories of the nature of rust resistance He believes that research on rust resistance would progress more rapidly were we to inquire as to what makes a plant susceptible rather than what makes it resistant. On page 207 he states "If we attempt to interpret the reactions of leaf rust in terms of factors for resistance, our explanation must be so broad as to include all vegetation except for the few susceptible varieties, but if we direct attention at factors for susceptibility, we need only search for the requirements of rust development that characterize these varieties. It is not so much a question of what defences all other plants have that these varieties lack, as of what positive qualities these varieties have that all other plants lack". This viewpoint is undoubtedly interesting although there will be many who will disagree with it.

In a book of this scope some portions will appeal more to some than to others. The agronomist, breeder, geneticist, plant pathologist and mycologist each has his own outlook and each will have his own criticisms. All must agree, however, that *The Cereal Rusts* is a contribution to knowledge since it stimulates thought in the mind of the reader. M. A. K

ASHTON, T. 633–2.112–1.521.6:578.08:575

Technique of breeding for drought resistance in crops.

Commonwealth Bureau of Plant Breeding and Genetics, Cambridge 1948 : 2s. 6d. Pp. 34. (Tech. Commun. No. 14).

Drought resistance in plants is a factor of considerable economic importance in many parts of the world. Attempts to breed for it, however, are complicated by the difficulty of finding a simple and practical index of drought resistance for use in selection work. Physiological characters such as water requirements and transpiration rate, and morphological and anatomical characters do not, in general, give a reliable indication of the reaction of plants to drought, and investigators differ in their views concerning the reliability of osmotic pressure and bound water content in this connexion. Direct methods of measuring drought resistance by field observations and pot wilting experiments have therefore been resorted to and special chambers have been constructed for testing drought and heat resistance.

In this bulletin, an account is given of experiments carried out in connexion with the problem of selection for drought resistance in various crops including wheat, oats, maize and sweet corn, barley, rice, millet, various species of grasses, potatoes, cotton, sugar cane, beet, tobacco, coffee, sunflower, fruit trees, vines, forest trees, tomatoes, beans and

peas. Much of the work on wheat has been carried out in the U.S.S.R. and information from Russian literature is included.
The bibliography contains 128 references.

BERKELEY, M. J. 633.491–2.411.4
Observations, botanical and physiological, on the potato murrain. Together with selections from Berkeley's Vegetable Pathology. Made by the Plant Pathology Committee of the British Mycological Society.
Amer. Phytopath. Soc. Michigan 1948 : Phytopath. Classics No. 8 : Pp. 108.

". . . the vegetable pathologist must, like the moralist, wrap himself up in his own virtue, and cast his bread upon the waters, assured that it will be found after many days, if not by himself, at least by his fellowmen in some succeeding generation". Thus wrote the Rev. Miles Joseph Berkeley in the general remarks opening his series of 173 papers on plant diseases which appeared under the title of *Vegetable Pathology* in the *Gardeners' Chronicle and Agricultural Gazette* between 7 January 1854 and 3 October 1857. Assuredly the succeeding generations have benefited from Berkeley's work, yet a knowledge of this work is debarred from many since the papers are not always easily accessible. The American Phytopathological Society have now published in their series *Phytopathological Classics*, Berkeley's paper on the potato murrain published in 1846 and selections from *Vegetable Pathology* chosen by the Plant Pathology Committee of the British Mycological Society There is also a biographical note by Dr John Ramsbottom.
Berkeley, gifted, hardworking and courageous, was one of the founders of plant pathology. In reading of his life one is awed by the list of his many activities especially since he was not a robust man. The volume of his scientific work is all the more impressive when one learns that he not only took his heavy ministerial duties seriously but that he and his wife ran a school for some years.
Many and various as were Berkeley's contributions, one of his major contributions was to establish the fact that disease can be caused by a parasitic fungus. His theory that the potato disease was due to what he called *Botrytis infestans* was not immediately accepted In 1854 he made the plea "Facts, and not merely ingenious theories unsupported by experiments are what is wanted . . .". Even in 1856, ten years after his paper on the potato murrain, he wrote that there was still opposition to his views although it was generally accepted that the haulm disease—powdery mildew—was due to a parasitic fungus. Berkeley clearly distinguished between parasites and saprophytes—"It is not every fungus which grows upon a plant which is really parasitic" and he recognized what is now known as the facultative parasite—". . . such moulds though not truly parasitic in their nature may at times act as parasites".
In the controversy which raged over the causes of the potato murrain one theory named the weather as the cause; Berkeley admitted in speaking of the relation of weather to bunt or mildew of cereals that ". . . in one sense, therefore, the atmospheric conditions are the cause, but merely as they stimulate into action the latent pest". Another theory, that of Schleiden, maintained that the potato disease was due to "high cultivation". In explain-in this theory Berkeley wrote "If, then, an increased dose of nitrogen be taken up from the soil in consequence of the use of highly nitrogenous manures, the balance as a necessary consequence is deranged and putrefactive fermentation ensues". While stoutly maintaining that Schleiden's theory did not explain the potato murrain he conceded that "The one cause, however, may greatly aggravate the other. . .". Thus did Berkeley foreshadow the discoveries concerning the relation of weather and nutrition to parasitic diseases. Berkerly's writings not only interest because of their historical value but on account of his advice so delightfully and forcibly expressed. But let him speak for himself—"There is, however, a concurrent tendency in the human mind to seek a cause for everything, and at the same time to rest contented with mere words, which give no solution to the difficulty. . . . The mouth of the vulgar is stopped by mere 'words without knowledge', while the person who uses them perhaps plumes himself on his superior insight into the secrets of nature.—It is far better . . . to confess our ignorance than to blindfold our own eyes, or those of others,

by unmeaning phrases or by unsupported conjecture. . .—It cannot, therefore, be impressed too strongly upon the minds of Vegetable Pathologists, of every degree, to divest themselves of all such vanities, and to track nature herself into her secret recesses". M. A. K.

KAYIHAN, S. 633.75(56)
Afyon ve diğer uyuşturucu maddeler. Bumaddelerin tabi olduğu uluslar arası ve ulusal mevzuat. Konferanslar, Mukaveleler, Anlaşmalar, Nizamname ve Kararnameler. (**Opium and other narcotics. Nations addicted to these substances and national regulations, conferences, agreements, laws and decisions**).
Ahmet Sait Matbaası, Istanbul 1946 : Vols 1 and 2 : Pp. 375.

In Volume I an account is given of the various kinds of opium poppy. In Turkey there are two main types, "open" and "closed". *Papaver somniferum* is of the open type. The yield of this type is comparatively good, but it has the disadvantage of shedding its seeds on maturity.

P. somniferum var. *inapertum* is a non-shattering type, with large smooth heads. It gives a better yield than the open type. Clay, sandy and chalky soils are favourable for its cultivation, as are also volcanic soils. On such soils the plant gives a light coloured opium. Poppy grown on humus and rich soils gives a darker opium with high morphine content.

In Turkey the closed type of plant is taller than that grown in other countries. The flower stalks are of medium thickness and smoke coloured, and the upper surface of the leaves, villous. The petals are white or purple. The seeds are white, yellow, black, smoke or coffee coloured. Notes are included on climatic requirements, cultural methods, incision of the capsule and collection of latex.

Opium in Turkey belongs to the following categories: "medicinal", with a morphine content of 12 to 15%; "emigrant" (a type from seeds introduced by Balkan emigrant refugees) with a morphine content 15 to 17%; this is included in the medicinal class; and "soft" opium, used in manufacture; that from the northern regions has a morphine content of 15 to 16%, while that grown in eastern districts has a morphine content of 8 to 10%.

The consistency of Turkish opium is somewhat soft, but on contact with the air it hardens and turns reddish-black.

The remainder of the book is devoted to a study of opium addiction in various countries, its effects, history, the opium wars, and efforts made in various countries to control the traffic in opium.

Volume II gives the clauses of the Hague Agreement, the Geneva Agreement, the Turkish-Yugoslav Agreement, and the regulations controlling the cultivation and marketing of the opium poppy in Turkey.

635:03(49.2)
Tuinbouwgids, 1948. (**Horticultural guide 1948**).
Uitgave der Directie van de Tuinbouw, Den Haag 1948 : f. 3.50.
Pp. 784. Plates.

The object in compiling this horticultural guide-book, first published in 1944, was to provide an up-to-date source of information that would be of use to the horticulturalist in his work. The practice of horticulture has not become simpler in recent years: technical and economic improvements and changes are being introduced and the grower must keep abreast of the trends and advances in horticultural science and practice. The guide will save him both time and trouble. Within its 784 pages space has been found for information on: postal tariffs, money, cheques, bills, weights and measures and their English and American (and some Russian) equivalents; telegraph rates; the Dutch Ministry of Agriculture and other official bodies connected with horticulture in Holland and abroad; advisory officers' names and addresses; horticultural instruction and educational institutes and their staffs, experimental plots and laboratories; official inspectors, etc., concerned with horticulture and the Dutch plant protection service; associations, clubs and charitable trusts; the Marketing Bureau, fruit growers' organizations; statistics, wages, social insurance,

accidents and their avoidance; horticultural equipment, packing, containers, etc.; the distribution of and areas under various horticultural crops and flowers in Holland; exports and market towns in Holland; taxation of all kinds; the Royal Dutch Meteorological Institute, and meteorological data and definitions.

Some short articles by experts on various horticultural questions are also included.

The whole enormous collection of facts and other information is made easily accessible by an excellent alphabetical subject index and also a system of blue interleaves each bearing a list of the contents of the following section of the book.

Dutch horticulturalists, technical college students, and consular officials, importers and other business men concerned with the export and import trade should find this small encylopædia invaluable.

There is a misprint, *Collectotrichum* for *Colletotrichum*, on p. 416.

HILL, A. G. G. 635–1.531.12–1.524

Seed production of European vegetables in the tropics.

Commonwealth Bureau of Horticulture and Plantation Crops, E. Malling 1948 : 2s. Pp. 28. (Tech. Commun. No. 19).

A questionnaire on the seed production of European and indigenous vegetables in the tropics was sent out by the Commonwealth Bureau of Horticulture and Plantation Crops in October 1944 to various agricultural authorities in different regions of the tropics, at the request of the East African Standing Agricultural Research Committee. The present publication summarizes the replies to the detailed questionnaire circulated, together with some additional information derived from other sources. It also includes a bibliography of 41 references, and appendices listing some vegetable varieties of temperate origin which are grown in several tropical countries of the British Commonwealth, the chief indigenous and naturalized plants used as vegetables in various tropical regions, relevant meteorological data for Kenya, India and Mauritius, and a list of countries to which the questionnaire was sent.

The investigations have led to some very important conclusions, as follows. (1) The evidence collected shows that, by using the wide range of altitudes available, seed of many so-called European or temperate region vegetables can be produced successfully in several tropical regions; apart from the standpoint of the tropical agriculturist, this knowledge is of value to plant breeders and seedsmen in temperate regions who could accelerate the seed production of new varieties by: (i) using crops in the tropics during the temperate region winter, thereby saving a season, and (ii) growing biennials in the tropics, where they will seed in about a year. (2) In the Kenya highlands, where the day length is about 12 hours throughout the year, every kind of vegetable so far tested, including long-day type, can be induced to flower and set seed by planting at high elevations, up to 10,000 ft. above sea level; this suggests that some accepted theories concerning the minimum photoperiod essential to induce seeding in certain long-day plants may need reconsideration. (3) It is pointed out that comparatively few locally acclimatized varieties of temperate vegetables have been developed in the tropics, whereas the converse process of adapting tropical and sub-tropical crops to temperate zones has, on the other hand, progressed. The possible use of tropical varieties of so-called European vegetables, e.g. peas, beans and cucurbits, by breeders in the temperate countries, and the use by breeders in the tropics of temperate varieties to introduce improved eating qualities into certain tropical vegetables, e.g. cucurbits, are suggested. (4) Attention is drawn to the need for research into (i) methods of storing roots and tubers in the tropics, particularly the potato, (ii) the improvement of indigenous and acclimatized vegetables of the tropics by breeding and selection, (iii) the breeding and selection of tropical varieties of the principal vegetables of temperate countries, particularly root crops rich in sugar and carotene, (iv) the unexplained sterility and low fertility of some temperate vegetable varieties in the tropics, and (v) the pollination and necessary spatial isolation of vegetable seed crops raised in the tropics. (5) Legislation would appear to be needed in many tropical countries to ensure testing of seed offered for sale. The methods of seed storage used by seed merchants also appear to require considerable improvement. (6) Investigations into production of temperate region vegetable seeds have been discontinued in most tropical countries now that imported seed

is again available. In East Africa the successful war-time investigations into vegetable seed production has been largely instrumental in initiating what appears to be a promising export seed industry. There is a growing demand for vegetables of the temperate regions, e.g. cabbage, pea and carrot, among the indigenous peoples of the tropics which should lead to a growing demand for good cheap seed, preferably locally produced.

635.635.00.15(73)

The Soybean Blue Book.

Amer. Soybean Ass. Iowa 1948 : Pp. 112.

This publication of the American Soybean Association gives information on the activities and personnel of the Association, local Growers' Associations and other organizations, official standards for soya beans and their products, industrial terminology connected with the soya bean, the location and personnel of research work on the crop in the United States, production figures for the crop and its various products, price data, and firms engaged in the soya bean industry of the United States.

INDEX

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Potato Collecting Expeditions in Mexico and South America. II. Systematic Classification of the Collections, by J. G. Hawkes	7	6
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Technique of Breeding for Drought Resistance in Crops, by Miss T. Ashton ..	2	6
INDEXES		
Subject Index to Vols I to V of Plant Breeding Abstracts	2	6
Subject Index to Vols VI to VIII of Plant Breeding Abstracts	2	6
Subject Index to Vols IX, X, XI, XII and XIII of Plant Breeding Abstracts each	2	6
BIBLIOGRAPHICAL MONOGRAPHS		
Bibliography on Interspecific and Intergeneric Hybridization in Relation to Plant Breeding	2	0
Rye Breeding Bibliography	1	6
Tobacco Breeding Bibliography	1	0
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